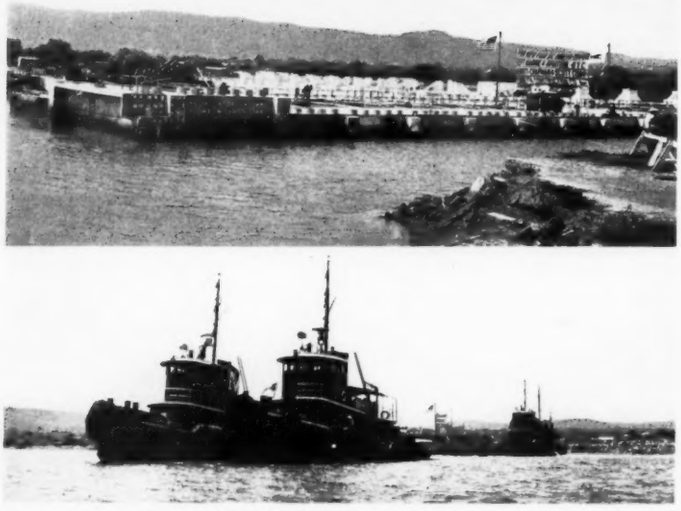
contractors and engineers monthly

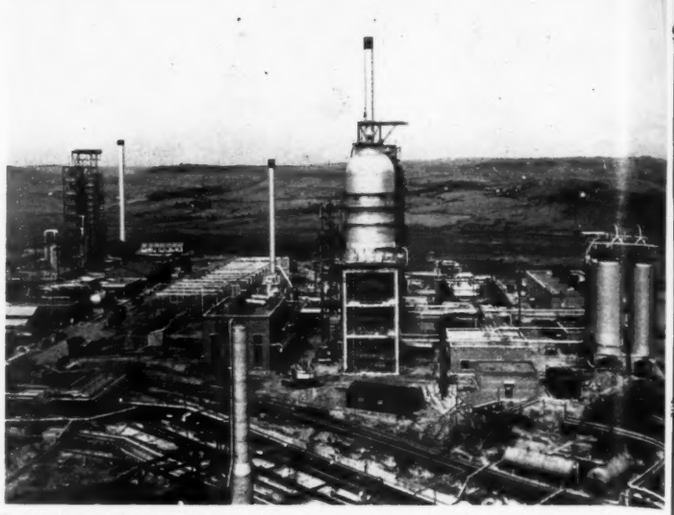
SEPTEMBER 1952

PORTUGAL'S NEW BRIDGE is the largest in the country and spans the Tagus River. Here at pier 24 the permanent arch span is in place and the service span from which it was erected is ready to be moved. Turn to page 54.

Dorman, Long & Co. Ltd. Photo



Box No. 1 of New York City's famed pontoon-type Pier 57 waits in a cut some 35 miles up the Hudson River. An hour later six sea-going tugs latch onto the 13,800-ton future bulkhead and begin the trip to the 15th Street site. They arrived only 13 hours later.



In Llandarcy, Wales, a fluid catalytic cracker with a capacity of 10,000 barrels a day is almost complete. Construction is being supervised by Kellogg International Corp., refinery and chemical-plant engineer and contractor.

NEWS AND VIEWS

of the construction industry – more toll roads, Carolina feud, building-trade wages

Toll roads continue to occupy a prominent position in the construction spotlight. The constant report is of more proposals for new toll roads and of more success for those already in operation . . . After a nation-wide banking syndicate turned over a check for $326 million, the **Ohio** Turnpike Commission cleared the way to advertise bids for its 241-mile superhighway . . . Construction of the 165-mile **Garden State Parkway** as a toll road will be temporarily financed by loan agreements with New Jersey banks. The State recently created the New Jersey Highway Authority and empowered it to issue revenue bonds. Temporary financing through New Jersey banks will keep construction going until voters can pass in November on a proposal to place the state's faith and credit behind a $285 million revenue-bond issue . . . On the list of recommended toll roads is a $275 million one that would run 315 miles from Jacksonville to Miami, **Florida,** with a 128-mile cross-state leg.

Sponsors of these ventures must be heartened by the success of the Denver-Boulder, New Jersey, and Pennsylvania Turnpikes. Already, it looks as if **Colorado** will pay off its superhighway at least 5 years ahead of schedule . . . The new 67-mile extension of the **Pennsylvania** Turnpike "has exceeded all our expectations," a spokesman for the Turnpike Authority announced . . . **New Jersey's** phenomenal turnpike brought in over $1½ million during June, and the figure is bound to get larger . . . The toll road is no panacea, but it does seem to offer a sensible and realistic approach to some of our highway problems.

A somewhat **different road problem in North Carolina** is attracting nation-wide interest these days. It all started back in 1949 when the State Highway Commission bought $5 million worth of road-building equipment and set out to build its own roads. Tar-heel contractors rebelled and the feud has continued ever since. The Bureau of Public Roads has now been called in as arbiter. In order to decide **whether states or contractors should build F-A roads,** the Bureau has set up 15 projects to be divided between low-bid contractors and state forces. The same specifications are used on each project, and special umpires are watching each team to keep tabs on the quality of construction. The final cost figures will undoubtedly influence the way the BPR spends its annual $500 million on secondary roads.

In case you've ever wondered, here are some **figures on how building-trades wages vary across the country.** According to the latest report of the Builders Association of Chicago, Newark, N. J., is way up on top. Bricklayers there earn $3.65 per hour, carpenters $3.40, structural ironworkers, $3.45, and common laborers $2.56. The bricklayers, carpenters, and ironworkers **also share in a pension plan.** On the opposite end of the ladder we have bricklayers in Greensboro, N. C., earning $2.25 per hour, carpenters in the same city $1.62½, and structural ironworkers in many southern areas getting $2.25. Common laborers in Wilmington, N. C., receive an hourly pay of 75 cents, and that's without pension benefits.

Just southwest of there at the Savannah River Project, a **new world's safety record** has been established for the construction industry. Over 10 million man-hours were worked without a single disabling or lost-time injury. DuPont notes that the project's frequency rate is 0.49 as compared to 40.0 for the industry.

Another symbol of southern progress: a new 17-story New Orleans office building for The Texas Co. The only large all-welded steel building in the city, it rests on 346 Raymond step-taper piles.

The white stuff this Cat grader copes with will be here sooner than you think. Are you ready for it?

Covering the Field

• **Bridges**
One in Portugal was built from a service span when the riverbed proved too soft for falsework. Pix too, on page 54.
One in Georgia, for a railroad, had to be rebuilt over the old one. Page 90.

• **Buildings**
Pix on page 22 show what the Marshall Plan helped do for housing in Italy.
Back home, some nifty planning permitted one crane to handle all steel erection for an industrial building. Page 26.

• **Compaction**
With new resonant-vibration equipment developed by the Navy. On page 43.

• **Concrete**
What to consider when you're contemplating prestressed-concrete work. Page 61.
Expect you've wondered from time to time how portland cement is made. Well, there's a story and diagram on page 98.

• **Conventions**
Need a calendar of ones coming up? Turn to page 83 and plan your autumn.

• **Dam**
They've made a start on the Snake River in Idaho. Page 35 tells about a road relocation and the diversion tunnels.

• **Distributor Doings**
The department starts on page 68, with a story about a service-conscious dealer.

• **Emergency**
Failure, in a city power plant! Rescue, by a Cat mobile electric set! Page 65.

• **Finance and Law**
Can you afford to die? Some question, that, propounded on page 73.
And can you afford to sign? The regular legal department starts on page 76.

• **Grading**
A slide was the villain in this piece about a million-yard dirt job. Page 46.
Excavation for this road reconstruction helped widen a causeway. Page 103.

• **Highways**
How the bituminous road was built for the WASHO test in southern Idaho. Story on page 10.
On page 51 the Ohio Highway Director tells how administrative action can help to solve the growing highway muddle.
For a recap on a recent road and bridge building in Cuba, try page 59. That country's program is really booming.

• **Irrigation**
They wanted to use a lake as part of a canal system, but first they had to flush it free of chemical salts. See page 19.

• **News and Views**
Among other things this month, it's toll roads and a survey of building-trade wages in the regular department on page 2.

• **Paving**
It was asphalt in Arkansas for 12 miles of resurfacing—three courses of blacktop in all. Turn to page 6.
It was tar hot-mix in Rhode Island for an access road to an airport—two courses on a gravel base. See page 31.
It was concrete in Utah—with widening strips 9 to 11½ feet wide on each side to turn an old road into a new. Page 79.

• **Photogrammetry**
A sketch of its growing importance, by a leader in the field. Page 15.

• **Pipelines**
A special skid rig helps put dual 24-inch gas mains to bed in the Hudson River. The account, and pictures, page 4.
Pipes up to 108-inch diameter will carry expressway runoff. Page 24.

• **Roadside Development**
Roadside plans in the Golden State put erosion control at the top of the list. Page 86 describes the whole program.

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William H. Quirk, Editor
Albert C. Smith — Catherine J. Hearn
Associate Editors
Raymond P. Day — L. H. Houck
Contributing Editors

Edgar J. Buttenheim, President
George S. Conover, Vice President
Donald V. Buttenheim, Publisher
Edwin Wagner, Secretary and Treasurer

BUSINESS OFFICES
470 Fourth Ave.
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George S. Conover
Warner H. Robinson

420 Leader Bldg.
Cleveland 14, Ohio
Robert C. Burton

2238 Ben Lomond Drive
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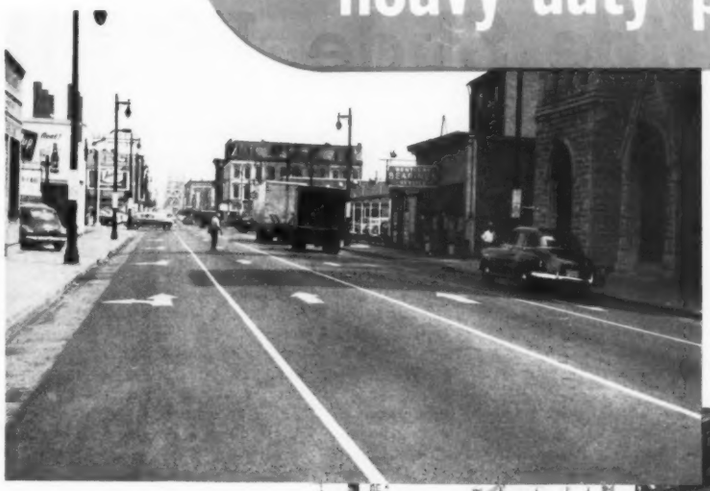
Where Louisville traffic calls for

heavy-duty paving



SECOND STREET, Louisville, Ky. (U.S. Route 31E), over which traffic approaches George Rogers Clark Memorial Bridge, is paved with hot-mix Texaco Asphaltic Concrete.

THIRD STREET, over which traffic from the bridge reaches US-31W, also is paved with hot-mix Texaco Asphaltic Concrete. The contractor was the George M. Eady Company of Louisville.

Second Street and Third Street in Louisville, Ky., are two of this city's most heavily traveled thoroughfares. Second Street is a one-way approach for traffic to the George Rogers Clark Memorial Bridge, which links Kentucky with Indiana. Third Street serves traffic coming from the bridge.

Due to the steadily increasing volume of bridge traffic, the Kentucky State Highway Department has widened both streets to four lanes. At the same time, a new heavy-duty wearing surface of hot-mix Texaco Asphaltic Concrete has been constructed on these busy thoroughfares in two courses, each 1½ inches thick.

In Louisville and throughout the country, road builders construct hot-mix Texaco Asphaltic Concrete paving wherever heavy traffic must be served—on important streets, main highways and major airports. Because of its ability to absorb impact, its freedom from joints, low susceptibility to temperature extremes and immunity to ice control chemicals, this type of construction is able to stand up under the hardest kind of service for years with a low upkeep cost.

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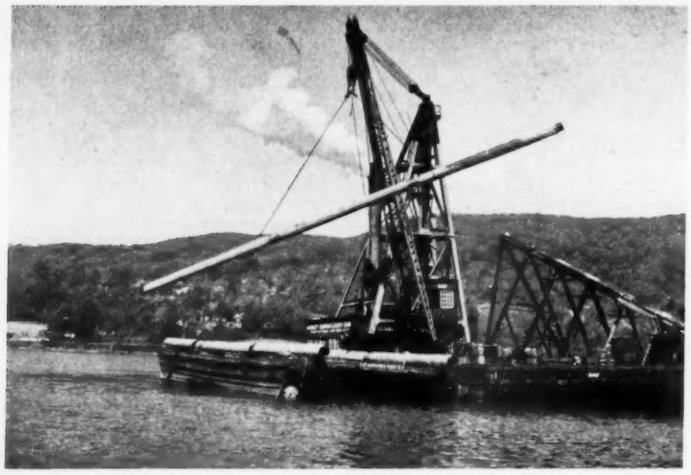
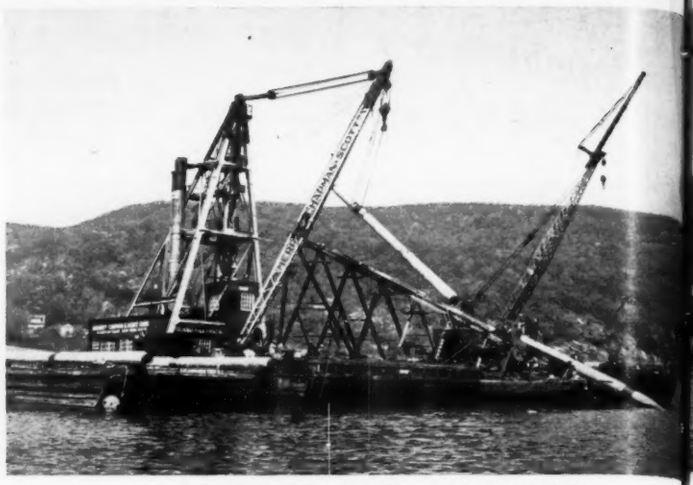
TEXACO

TEXACO ASPHALT



The 100-ton derrick boat Chief lifts a 120-foot length of pipe from the supply barge . . .



. . . and sets it on the supporting cradle of the skid rig.

Down the Slide, Into the River

Special Skid Rig Lays 120-Foot Sections of Gas Pipeline at Mile-Long Crossing in Bed of Hudson River

By WILLIAM H. QUIRK,
Editor

• MERRITT-CHAPMAN & SCOTT CORP. of New York City recently completed the laying of twin 24-inch natural-gas pipelines in trenches dredged across the bottom of the Hudson River from Verplanck on the east shore to Tomkins Cove on the west. Located about 35 miles upstream from New York City, the underwater mains are part of the long pipeline that is to carry natural gas from Texas and Louisiana to New England. The twin crossings will serve a transmission system now being built by the Algonquin Gas Transmission Co. from Lambertville, N. J., where it ties into the "Big Inch" line operated by the Texas Eastern Gas Transmission Co., to Boston, Mass. Lateral lines will fan out to the southeastern areas of New England.

The first of the 5,200-foot crossings was started in November, 1951, and was completed last January. Bad weather then closed in on the river bringing further work to a halt. After the ice cleared away in the spring, the contractor moved back in, and on April 15 began laying the second line 100 feet north of the first. Working from the east to the west shore, M-C&S completed the second main on May 10. Over half of the 250-mile link between Boston and Lambertville is now finished. It will be the final link in the long 2,200-mile transmission line.

Ford, Bacon & Davis, Inc., New York consulting-engineer firm, acted as agent for the Algonquin Gas Transmission Co. on the pipeline project. Bethlehem Steel Co. furnished the pipe; Great Lakes Dredge & Dock Co. dug the trenches for the pipe across the riverbed; and M-C&S handled the 120-foot sections of line and lowered them into position in a continuous operation carried on from a skid rig specially built for the job.

Special Skid Rig

At the point of crossing the Hudson is 50 feet deep. The bottom of the trench is 15 to 17 feet below the bed of the river and is 15 feet wide. To ease this mile-long pipeline gently into a trench at least 65 feet below the surface of the water, the contractor built a special pipe skid rig at his Rosebank Yard on Staten Island.

A heavy steel A-frame was dismantled from one of M-C&S's big floating derricks and the boom removed. The framework was then secured to the deck of a car float—280 feet long x 36 feet wide x 11 feet deep—with its two front legs lying flat and its third sloping upward from the bow of the big barge. Heavy steel extensions and reinforcing girders had been added to the A-frame until its upper sloping leg was approximately 140 feet long. From a height of 50 feet at the rear end, this incline slopes to the water at a 20-degree angle.

Steel channels were welded to the sides of the upper leg to form a trough that would accommodate, with room to spare, 120-foot sections of the concrete-encased 24-inch pipeline. The prime function of this unique and unusual-looking float assembly was to ease the continuous length of gas main into the river without strain, as additional sections of pipe were welded together on its sloping incline. A tug towed the float up the Hudson to a point on the east side of the river just above Verplanck where the pipe trench had already been dredged.

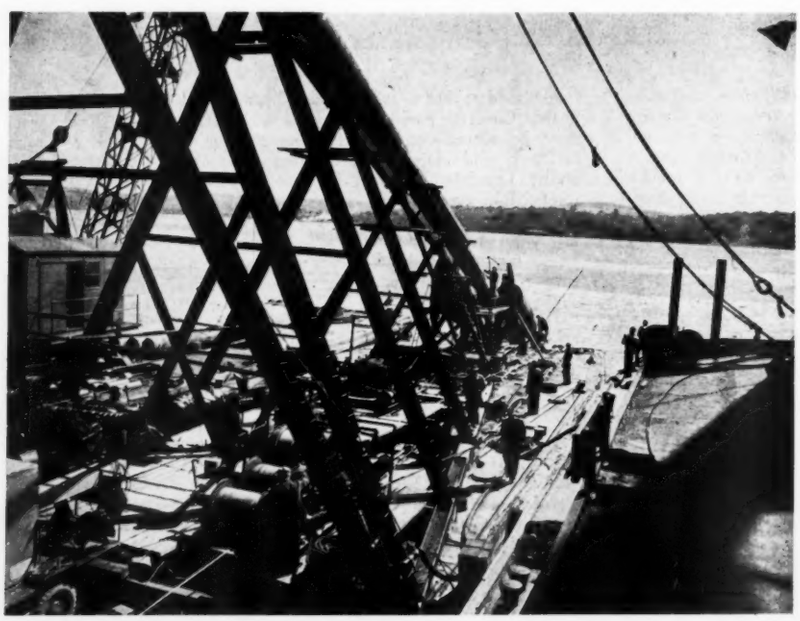
Preparing the Pipe

In the meanwhile, 40-foot lengths of the ½-inch-thick steel pipe were assembled at the contractor's yard on the east side of the river, downstream of the crossing. The pipe was made up of 10-foot sections of steel plate that were joined together with circumferential welding; this was done at the steel mill. At the site, three 40-foot lengths were welded together to form a single 120-foot section.

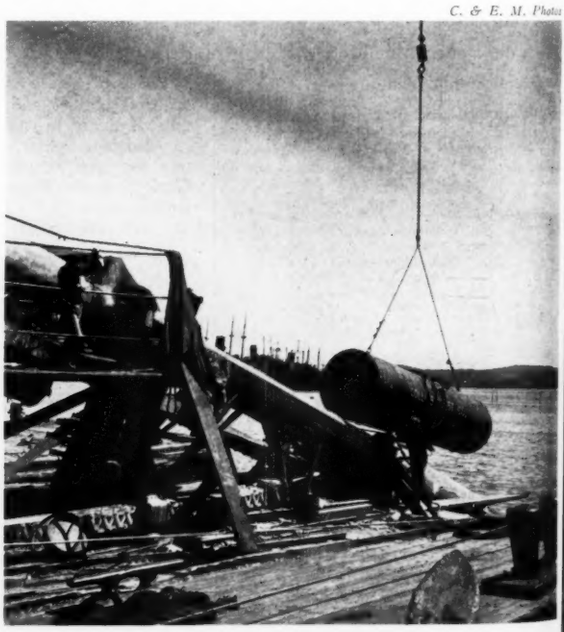
Split sleeves in two pieces of steel—½ inch thick x 9 inches long—were also welded around each joint to strengthen the connection. The pipe was then coated on the outside with a 3/32-inch layer of Bitumastic 70-B pipeline protective enamel. At the ends, 1½ feet of pipe was left bare for welding the section to the rest of the line. The protective coating was then covered with 3 inches of Gunite.

This Gunite was a mixture of sand.

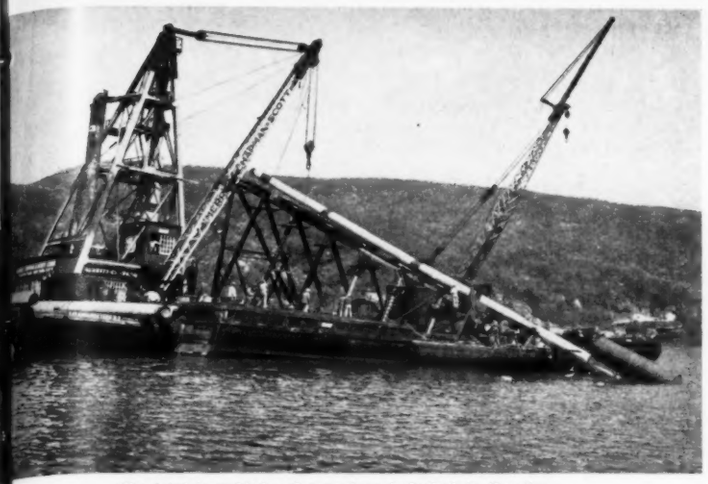
C. & E. M. Photos



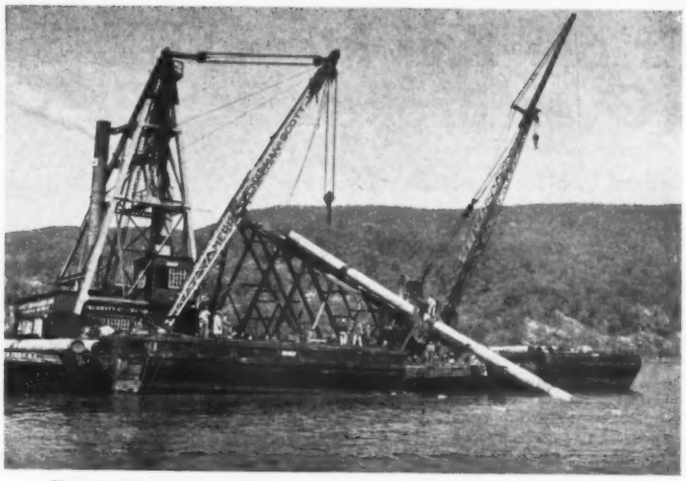
This special skid rig which guides the pipe into the water was made up of dismantled derrick members. Heavy steel extensions were added to give a sloping leg of 140 feet.



A joint is welded as a pontoon is lowered on top of the pipe. A trigger device releases straps from the pontoon when the pipe reaches bottom.



The joint is welded and a pontoon is lashed to the pipe.



Now, as the car float moves across the river, the pipe slips into the water.

cement, and barium-sulphate ore, the ore aggregate being added to increase the weight of the Gunite to about 300 pounds per cubic foot, which is about twice the weight of regular Gunite. When coated with a thickness of 3 inches of this material, the pipe weighed about 500 pounds per linear foot in air, about 190 pounds per linear foot in sea water, and was heavy enough to sink through silt weighing 90 pounds per cubic foot in the bottom of the trench. While this Gunite was applied primarily to insure the pipe sinking into the bottom of the trench through the silty material which might collect there, it also protected the Bitumastic coating while the pipe was being handled and lowered down the skid.

Cradled in the Chute

The 120-foot lengths of assembled pipe were loaded onto a barge which was towed out to the skid rig, moored in the river directly over the dredged trench. Along the downstream side of the car float, M-C&S had lashed its big coal-burning derrick boat Chief, equipped with a 97½-foot boom that could lift 100 tons. The pipe barge, in turn, was secured to the downstream side of the Chief. Fastened to the upstream side of the skid rig was the Climax, another floating derrick boat on which was mounted a Marion crane equipped with a 95-foot boom. Heavy mooring anchors from the Chief, car float, and Climax held the floating equipment in exact position against the current.

In a typical operation of adding another section to the pipeline being laid across the river, the Chief picked a 120-foot length of pipe, weighing approximately 35 tons, off the supply barge and set it down gently in the cradle of the chute on the skid rig. It was then eased down the sloping slot until its lower joint fitted snugly against the upper joint of the partially lowered section ahead of it.

Welders at once went to work joining the two ends of the pipe together as it rested in the chute. Welding was done by the Hallen Co., Inc., of Long Island City, N. Y., using a pair of Lincoln 200-amp machines set up on the deck; a third unit was held as a standby. First a butt joint was made with 5 passes in which 5/32-inch rods were employed. The weld was then X-rayed with careful scrutiny for any flaws. After that the steel collar or sleeve was welded on, using 3/16-inch rods. This was followed by the special compound wrapping which was heated in a Littleford heater also mounted on the deck.

Down the Slide

While the joint was being welded, a steel cylindrical pontoon—20 feet long x 5-foot diameter—was lashed to the pipeline just below the joint. The pontoon was secured to the top of the pipe with three high-tensile steel straps, each 2 inches wide, that were strung around the pipe and pontoon and pulled taut by a special baling machine. Each strap passed through a synchronized trigger device by which all three straps could be cut simultaneously from above water by simply tugging on a cable.

Six of these large pontoons were on the job. Each had a lifting capacity of 21,268 pounds, and was filled with 25 pounds of compressed air to keep it from collapsing. It was necessary to keep only three on the line at one time, however, to maintain a delicate balance as the pipe was being lowered. They prevented the pipe from bending or rupturing by settling to the bottom at too sharp an angle. The three were equally spaced, with the last one 360 feet out from the car float. Beyond that point the line was already down in the trench. The last pontoon, or the one farthest out from the skid rig, was released as soon as the pontoon on the next length of pipe went into the water.

These big pontoons were painted red, and were tied to floating buoys of the same color. To give added buoyancy to the submerging pipe, a smaller secondary pontoon was also lashed to the pipe in the same manner at a point about 40 feet from the front end. The smaller pontoon was cylindrical-shaped, 3½ feet long x 2½ feet in diameter, and was painted yellow, along with the locating buoy. It had a lifting capacity of 2,620 pounds, and was released together with the farthest big pontoon as soon as the pipe submerged. Pontoons were lifted into place by the Climax, on the up-stream side of the skid rig.

Into the River

The actual "paying out" of the pipeline was done smoothly and rapidly. Mooring engines on board the skid rig and the derrick boats hauled in on the forward anchor cables, and slacked off the aft lines. As the car float moved across the river, the pipeline slid down the chute and into the water, carrying the pontoons with it. At the rear end it was snubbed in the slide to permit the addition of another 120-foot section.

As the pipeline gradually sank in the water, its great weight was eased down by the pontoons. Now that they were no longer needed, the cylinders were cut loose by the release mechanism at the buoys, tripped by a man in an outboard motor boat. The freed pontoons surfaced with great speed, breaking water like porpoises leaping for a fish. They were retrieved, and towed back to the car float for fastening to the next length of pipe.

No sooner had a section been sunk than the Chief was swinging another 120-foot length of pipe into the sloping cradle. Welding was started at the new joint, and the pontoons were lashed into place as before. In the average single-shift work day, three to four 120-foot lengths were successfully laid in the river-bottom trench. A fourth section was sometimes made when the weather was right and river traffic light.

A large pontoon released from a section of pipe just sunk, clears the surface of the water with a swoosh!

The contractor started on May 20 to backfill the two trenches with stone for a distance of 1,000 feet from the west shore. The pipelines at this location were in the area used as anchorage for one of the "moth-ball" merchant fleets of the U. S. Maritime Commission, where there was danger of damage to the pipe from anchor chains.

Personnel

Merritt-Chapman & Scott Corp. employed an average crew of 25 on the pipe-laying assignment. William Hepworth was M-C&S Project Manager in charge of operations at the site, and James T. Denton was General Superintendent, both working under the supervision of Joseph S. Myers, Assistant to William Denny, Vice President in charge of the company's New York Marine and Heavy Construction Division, and Ralph E. DeSimone, President. Taylor MacElroy was Project Engineer, with Arthur Rondeau, Office Manager.

Howard Hayes was Project Manager on the job for Ford, Bacon & Davis, Inc., the consultant, with Peter New, Resident Engineer.

Jim Hardy was Foreman in charge of welding operations for the Hallen Co., Inc.

Jim Denton, General Superintendent; Bill Hepworth, Project Manager; Taylor MacElroy, Project Engineer; Jim Hardy, Welding Foreman; Peter New, Resident Engineer.

Triple Blacktop Laid Over Broken PC Slabs

Modern Two-Ton-Per-Minute Plant Feeds AC Base and Surface To Road Crews on 12-Mile Resurfacing Job

C. & E. M. Photo

Two of the three 8,800-gallon storage tanks at the right of the picture contain asphalt for the base and surface mixes on U. S. 67; the third holds MC-1 cutback asphalt for priming and tack coats. A Bay City 59 works the stockpiles and charges the feed bunkers.

• TEXARKANA, straddling the border of Texas and Arkansas, might well be termed the gateway to the southwest. The city is a focal point for more than transcontinental highway, but U. S. 67 carries the main burden of east-west traffic through the city. The road starts deep in Texas, sweeps northeast across Arkansas, and runs on up into the industrial heart of the nation. Heavy truck traffic has been pounding its way along this road in both directions for over 20 years now and has taken a heavy toll on the life of the pavement.

The section of U. S. 67 northeast of Texarkana is an 18-foot 9-6-9 portland-cement-concrete slab with mesh reinforcement. It was built around 1930. Engineers didn't know much about selected subgrade then, so the slab was just set on mule-tamped fill. Lacking a good subgrade, it couldn't stand up under the constant traffic load. It pumped, it broke, it went to pieces.

Maintenance forces of the Arkansas State Highway Commission worked on the road with unceasing effort. They patched; they pumped mud under the slab; they sealed joints. They did the best they could with limited road funds, but it wasn't enough. So this year the worst sections of the old road are getting a complete overhaul.

Preliminary Work

The 12-mile stretch between Fulton and Hope, Ark., just above Texarkana, is typical of the job being done. Tecon Construction, Inc., Dallas, Texas, got the contract on a low bid of $493,816. An additional 10 per cent of this figure was provided by the State for engineering and contingencies.

Tecon moved onto the job in October, 1951, while another outfit was doing work on the shoulders and drainage structures under a separate contract. This contractor had cut the shoulders down 12 inches, widened them, then replaced them with 6 inches of compacted selected material and 6 inches of gravel. He had also lengthened the drainage structures. This gave the road a 48-foot crown with 3-to-1 fill slopes.

Tecon primed the new shoulder with an MC-1 cutback asphalt at a rate of 0.4 gallon per square yard; one side of the bar on an Etnyre distributor gave a full 13-foot cover over the shoulders. Then Tecon applied an MC-1 tack coat to the old road surface, 0.03 gallon to the yard, at about 130 degrees F.

The State had planned to break up the worst concrete sections and repack them right in place. A few test sections showed that this wouldn't work. The broken concrete increased in volume 20 to 30 per cent. This meant that some had to be removed. Rolling was impossible because sizes weren't well proportioned for tight compaction and there was water in the subgrade. The result was a wavy surface.

So, in the bad areas, French drains were installed from the edge of the pavement to the ditch, to pull the moisture out of the subgrade and provide a better foundation for the reconstructed road. Tecon then covered these areas of broken concrete with a Type 2 asphaltic concrete (¾-inch and smaller stone with an asphalt content of 4.75 per cent) at an average rate of about 130 pounds per square yard. This part of the work took 6,600 tons of mix. In the test sections, excess broken-up concrete was removed, and Type 2 mix used to fill in the depressions.

Design of the Mixes

The spex called for resurfacing with a double base course and a single surface course. The base went down at 600 pounds per square yard—each course about 3 inches thick. The surface was laid at a rate of 200 pounds per yard—2 inches thick.

All material for the base passed a 1½-inch screen. The asphalt content was 4.75 per cent, by weight. Surface material was all under ¾ inch in size. The asphalt content, 6 per cent, was relatively high for the south. It was a 60-70 penetration; placing temperatures ran 300 to 315 degrees F.

Two types of sand were used on the job: a coarse "concrete" sand and a finer field sand. Limestone dust was

EUCLID 22 TON MODEL TD FEATURING HYDRAULIC BOOSTER STEERING. Marvel Synclinal Filters are installed in sump (indicated by arrow) as standard equipment to protect the entire hydraulic system against damage from the highly abrasive particles prevalent under the severe conditions to which "EUCS" are subjected.

(Photo Courtesy Euclid Road Machinery Co., Cleveland, Ohio)

MARVEL SYNCLINAL FILTERS

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SUMP TYPE (Cutaway) LINE TYPE (Cutaway)

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625 W. Jackson Blvd. Chicago 6, Ill.

added to the material for the surface course. Here are the batch proportions and aggregate gradations:

Batch Proportions (Weight in Pounds)

Materials	Base	Surface
Stone (1¼ to ¾-inch)	1,219	....
Stone (under ¾-inch)	1,448	1,053
Coarse sand (No. 10 screen)	1,143	1,128
Fine sand	....	1,391
Limestone dust	....	188
Asphalt	190	240
	4,000	4,000

Aggregate Gradations (Per Cent Retained on Screen)

Sizes	Base	Surface
1½-inch	0	.....
¾-inch	15–30	0
No. 4	50–65	20–40
No. 10	65–80	40–60
No. 40	75–90	65–80
No. 200	95–100	90–96

The new roadway is 24 feet 6 inches wide, extending 3 feet 3 inches onto the primed shoulders on each side. Two lanes of traffic were kept open except on the small working stretch, where flagmen diverted traffic into a single lane.

Plant Setup

Tecon brought in a 2-ton-per-minute Madsen plant and set it alongside the highway about 4 miles from the north end of the job. A siding of the Missouri-Pacific, which parallels the highway, was available at the plant.

Big Rock Stone & Material Co., Little Rock, Ark., supplied all stone for the job. Merriweather Sand & Gravel Co., Lewisville, Ark., supplied the coarse sand. Both were delivered to the plant by rail. Tecon itself obtained the fine sand from nearby pits using a Hough Payloader and a couple of 5-yard dump trucks. Asphalt was brought in by 4,000-gallon semitrailers from the Berry Asphalt Co. refinery at Waterloo, Ark. Batesville White Lime Co. shipped the 100-pound bags of limestone dust by boxcar.

At the plant a Cat D6 dozer worked the stockpile, feeding a Bay City 59 crane with a 1-yard clam. Aggregates went into a four-compartment Madsen feed bunker built up to hold 25 tons per bin. Syntron vibrators were mounted on two sides of the field-sand bin to prevent arching. All materials fed onto a 20-inch troughed conveyor powered by a Chrysler gasoline engine.

A 7 x 15-inch cold elevator carried the aggregate up to a Madsen 24 x 84-inch dryer. Three Hopkins Volcanic gas burners brought the temperature of the stone and sand up to 350 degrees F. A Caterpillar D8800 diesel delivered the power drive for the cold elevator and the dryer.

A 7 x 15 hot elevator carried the material to the top of the tower and dumped it on the screens—Symons 4 x 12's. To process material for the base courses, Tecon used 1½, 1, and ⅝-inch, and a No. 10 screen. For the surface mix, it used a ½-inch, a ¼-inch, and a No. 10. The tower had four hot bins and two overflow bins.

A No. 380 Cyclone dust collector with a 6-inch screw conveyor brought dust taken from the dryer back into the mix. The limestone dust (for the surface course) was dumped onto an 8-inch bucket elevator outside the tower and carried by screw conveyor to a small bin at the top. A Cat D375 engine supplied all power required by the tower units.

Asphalt was taken from the semitrailers at 300-325 degrees F and pumped into two 8,800-gallon storage tanks by a 3-inch Viking pump. A Clayton 50-hp steam generator supplied the heat for the tanks and steam power for the pugmill gates. A 2-inch Viking pump brought the bitumen up from the big tanks to a 500-pound tank on the tower.

Water was taken from the Hope city mains and brought to the plant in a 1,000-gallon tank chained on a flat-bed truck. A 75-kw generator supplied all electricity.

The 2-ton batch was weighed on Yale dial scales, mixed for 50 seconds, and dumped into 8 and 10-ton trucks waiting below.

Field Testing Lab

The Highway Commission maintained a field laboratory at the plant to check all mixes. One to three batch samples were taken and tested each day. The Department used a Dulin Rotarex separator for this purpose. An additional sample was sent to the lab at Little Rock. Screening tests were made on bin samples twice a day. Density samples were taken from the road two days after the mix was placed, and sent to Little Rock.

Mix Sets Up Fast

A Barber-Greene finisher made the laydown in a 12-foot width. A Buffalo-Springfield 8-ton tandem and a Galion 10-ton three-wheeler did the rolling. The mix on this job set up fast because of the high asphalt content and high proportion of fines, so the rollers were

(Concluded on next page)

JERSEY SPREADER MODEL 100

Here's the machine that set new records for fast, low-cost stone spreading on Newark Airport and Jersey Turnpike jobs! Spreads up to 20 tons per min., ¾ in. thru normal macadam range stone in 1 to 12 in. depths, 10 to 13 ft. widths . . . . Mounts on dozer push beams of heavy tractors; trucks feed directly into hopper. Can replace 2 big motor graders yet costs less than $3,000!

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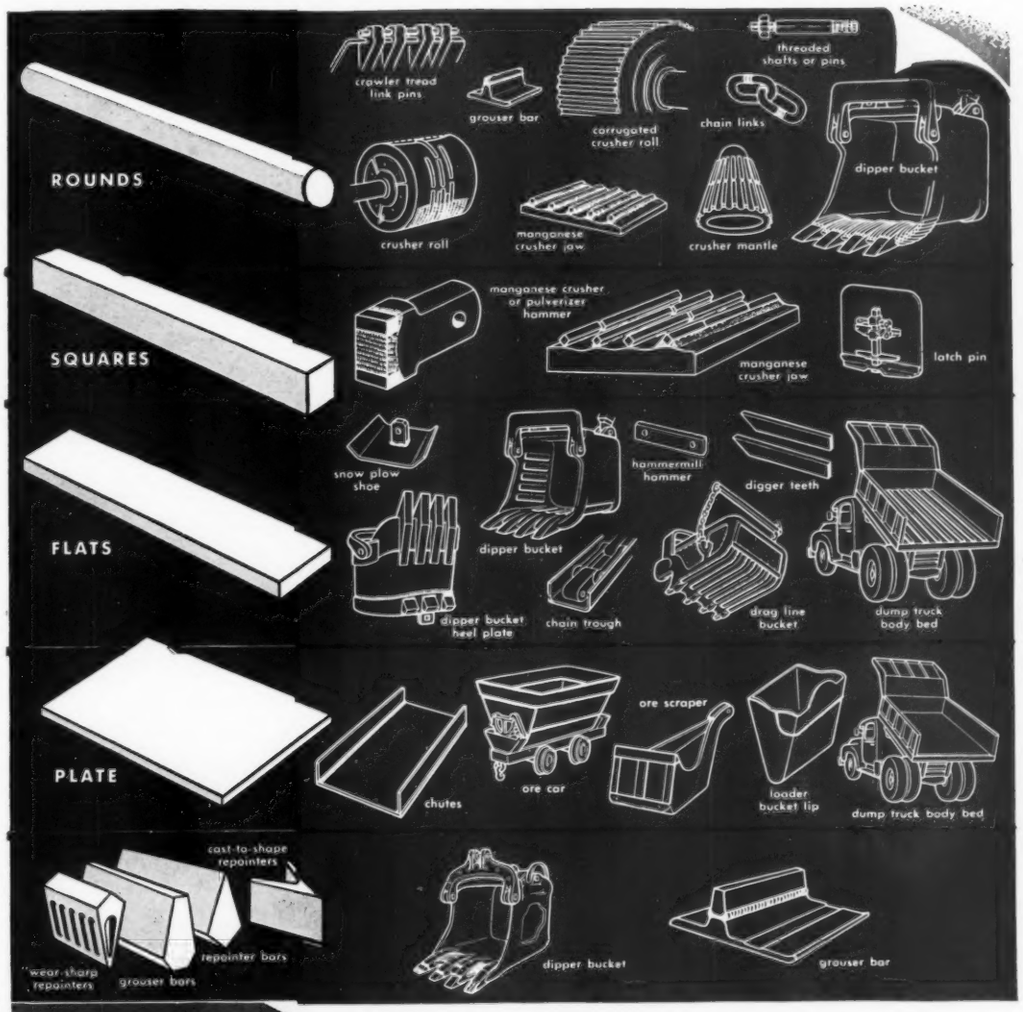

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Triple Blacktop Laid Over Broken PC Slabs

(Continued from preceding page)

able to work right up to the finisher. Tecon laid one course of base one day, the adjacent lane the next day, and then the upper base course, on the same stretch, the following two days. This kept trucks from ripping up the centerline edge. When all of the base was down, placing of the surface mix began. A Grace rotary broom pulled by a Chevrolet pickup handled the sweeping between courses.

The last stage of the work consisted of supplying 25,000 cubic yards of compacted gravel to bring the shoulders level with the pavement surface. A Caterpillar No. 12 grader took care of the spreading, while a Tampo pneumatic-tire roller, pulled by a Hough Payloader, did the compacting.

All work was kept ahead of schedule in spite of a few job problems. There wasn't much cold weather, so little time was lost on this account. But winter rains and delayed delivery of aggregate stopped the job a couple of times. Another problem was the abrasiveness of the aggregates, which wore out three pugmills during the processing of 55,000 tons of base material.

C. & E. M. Photo

A Buffalo-Springfield 8-ton tandem roller works close behind a Barber-Greene finisher on U. S. 67 in Arkansas. Tecon Construction, Inc., was the contractor.

Personnel

R. E. Cargile directed the work on this project for Tecon Construction. Frank Gooch was Plant Superintendent. J. S. Snead supervised the road crews. Tecon had eleven men on the road work and 10 at the plant. There were another 30 men working part of the time driving trucks, handling the limestone dust for the surface course, and attending to extras.

W. F. Turner was Resident Engineer on the job; Bill Wood, Materials Testing Inspector at the plant. The Arkansas State Highway Commission is headed by Olen Fullerton, Director. A. E. Johnson is Chief Engineer and E. E. Mashburn is Construction Engineer.

Bricklayers Get Increase

A new two-year agreement on wages calling for an hourly rate of $3.55 for bricklayers in New York City has been reached between the A. F. of L. and the Building Contractors' and Mason Builders' Association, an organization of 90 masonry and general contractors affiliated with the Building Trades Employers' Association of New York City. An increase of 30 cents an hour over the previous rate of $3.25, the new rate is retroactive to June 1 and will remain in force until May 31, 1954. The old agreement between the Mason Builders and the bricklayers' union expired last May. The new wage covers bricklayers working in the five boroughs of New York and part of Long Island.

The first pension fund for bricklayers in the United States has been established in New York City, with accumulated deposits of over one million dollars contributed by the employers. Upon retirement at 65, a bricklayer will receive $2.50 a month for life for each credited year he was employed. This fund is not affiliated with Federal Social Security and is available to the same bricklayers affected by the new wage increase provided their contractors have contributed.

Eutectic Appoints Director

Helmut Thielsch has been appointed Director of Applied Welding Engineering for Eutectic Welding Alloys Corp., Flushing, N. Y. He has spent the past three years on the Welding Research Council in charge of preparation of critical correlated literature for research investigators and interpretive engineering reports for practical engineers.

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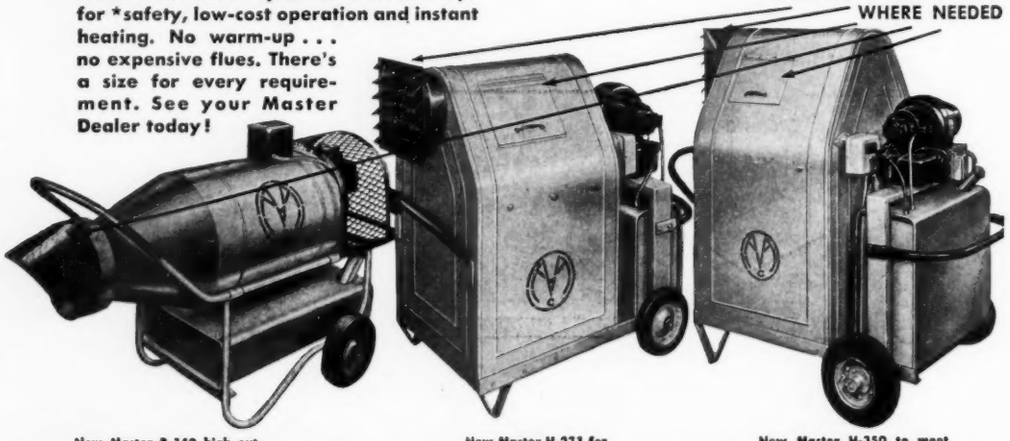

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New Master H-231 for larger heating jobs.

New Master H-350 to meet large heating output requirements.

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MODEL NO.	CAPACITY	*SAFETY	BURNER	FUEL	FUEL CONSUMPTION	HOT AIR OUTPUT	CONTROLS	SIZE	WEIGHT
B-140	140,000 BTU per hour	Indications of carbon monoxide in the exhaust gases of the kerosene fueled Master Space Heater was less than 0.001 per cent by volume . . . as tested by an independent testing laboratory. According to accepted standards this content is one tenth of the amount considered hazardous.	Approved by Underwriters' Laboratory	Kerosene, No. 1 Fuel Oil or No. 2 Fuel Oil	1 gal. per hr.	800 C.F.M.	Fuel tank and burner safety control, solenoid pump control, thermostat control available extra.	W-24½" L-58" H-34"	145 lbs. less fuel
H-231	241,000 BTU per hour				1.65 gal. per hr.	1500 C.F.M.	Thermostat for full automatic temperature control. Fuel tank and burner safety control. Over-heat safety control.	W-29⅜" L-51¼" H-45¾"	295 lbs. less fuel
H-350	350,000 BTU per hour				2.5 gal. per hr.	2500 C.F.M.		W-31½" L-58" H-58"	360 lbs. less fuel

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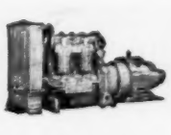

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Concrete surfacing attachments for vibrators

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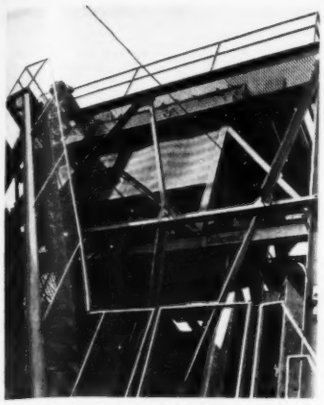


A stairway with Safe-T-Mesh treads leads from the ground level up to a non-skid expanded metal walkway surrounding the screen unit at the top of this Cedarapids 110-ton hot-mix plant. Further information on the stairway may be secured from Wheeling Corrugating Co., Wheeling, W. Va. Circle No. 645 on card at page 16.

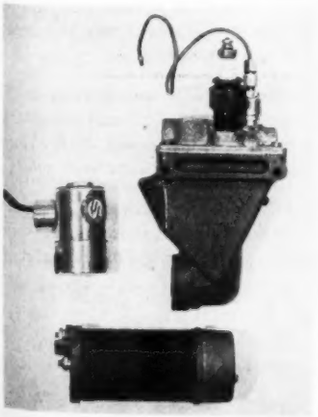
Cold-Starting Device For Gasoline Engines

A new device for starting engines in less than 30 seconds in temperatures as low as minus 65 degrees Fahrenheit is announced by Robert Reichhelm Co., Stratford, Conn. Originally developed for aircraft engines, and currently being tested by the Army, the Gasifier is said to be capable of starting gasoline engines without using an external heating source. Adequate cranking power is necessary for its successful operation, however, and Arctic lubricants of low viscosity must be used in the engine crankcase.

The device supplements the carburetor for starting only. It is essentially a fuel precombustion chamber with a conventional sparkplug. As the engine is cranked, a primer button is pressed, energizing the sparkplug and solenoid of the gaseous priming system. Cold fuel from the engine pump is diverged to the Gasifier from the carburetor line. As the fuel enters the Gasifier, a portion of it is burned and the rest passes through the flame and becomes gasified.

This very hot gasified fuel enters the intake manifold of the engine where it is mixed with the air coming through the carburetor throttle. This action produces a hot combustible mixture which enters the cylinder and permits easy starting at intense cold temperatures. The priming system can be used as long as it is required to warm up the engine. After the engine has warmed up sufficiently, the primer may be cut off and the warm engine can take over on the carburetor.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 594.



In the upper right is the Reichhelm Gasifier with sparkplugs. Accessories shown are (upper left) an electric valve and (bottom) an ignition coil.

Urges Spray-Gun Painting

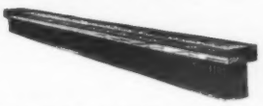
The use of the spray gun has long been a controversial problem in the painting industry. J. W. Zucker, President of the Painting and Decorating Contractors of America and a member of the Board of Governors of the Building Trades Employers' Association of New York City, took a positive stand on the matter in addressing the New York State Conference of A. F. of L. painters. He warned that unless mechanical equipment is adopted, the painting industry will not be able to compete in the growing use of new plastic-type coatings; he urged that painters join with contractors in the adoption of mechanical equipment.

The use of the spray gun is now controlled at the local level on the basis of negotiated agreements between employers and unions. Mr. Zucker feels, however, that the mechanism must be made available to union journeymen to apply the so-called plastic coatings if they prove successful.

"If our work can be made more efficient, if production can be increased, if some of the toil and hardship can be taken out of our industry through mechanical processes, then it is incumbent upon us not to set ourselves up as obstacles to progress. . . ."

A Wire Drag Broom

A continuous spring-steel-wire drag broom for dragging and leveling sand or gravel on bituminous, seal-coat, or



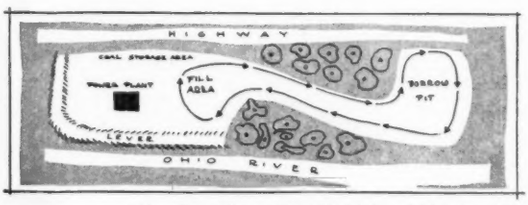
The Big Peckerwood spring-steel-wire drag broom is 6 inches wide. With its kid brother Small Peckerwood, unit lengths range up to 12 feet. Made by Van Brush Co.

nacadam roads is made by Van Brush Mfg. Co., 327 Southwest Blvd., Kansas City 8, Mo. The broom, constructed of hardwood lumber, is 6 inches wide and has over 100 holes per foot, filled with triple steel wires that cannot come out.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 636.

DRY FEET FOR CINCINNATI POWER PLANT

3 LPC MOTOR SCRAPERS BUILD 1,500,000-YD. LEVEE TO PROTECT IT FROM THE OHIO RIVER



Here's a power plant that will keep dry and operating come Hell or high water, now that it's protected from Ohio River floods. Richter Transfer Co., of Cincinnati, is using three TS 300 Motor Scrapers to build a levee around the Cincinnati Gas & Electric Company's power house at New Richmond, Ohio, right on the river's bank. They are also leveling for a coal storage area adjacent to the power plant. It's a tough operation that calls for the best in earthmoving equipment.

On this job, Richter Transfer Co. is moving approximately 1,500,000-yds. of heavy, wet clay with their three TS 300s. Each Motor Scraper is hauling 50 loads a day on a 6000-ft. cycle, and getting a 15-yd. pay load every trip. Ejection of the sticky clay is no problem with the Motor Scraper's positive forced ejection *plus* the extra high apron lift. There's no chance for material to jam between the ejector and the apron. Extra power and big tires move the rigs through the heavy fill area without bogging down.

It's Another Profitable Job for RICHTER TRANSFER CO., Cincinnati, Ohio

It's no wonder more and more profit-conscious outfits like Richter Transfer Co. are using TS 300 Motor Scrapers for their toughest jobs, because when a rig handles the tough ones easily, it's a profit-producer for every earthmoving job. With TS 300s you get really big capacity . . . 14-cu. yds. struck and 18-cu. yds. heaped. That means greater pay loads each trip. Speeds in excess of 22 miles per hour mean more trips per hour. Easy loading characteristics and positive forced ejection, plus an 8' 9" front apron opening, cut valuable seconds off the operating cycle. Big power . . . with your choice of two diesel engines, a 280 HP Buda or a 275 HP Cummins, gives you power to spare in the pit or in the fill, and insures top working speeds at all times.

Whether your job calls for one unit or a dozen, it will pay you to check all the profit-making features of TS 300 Motor Scrapers. See your LaPlant-Choate distributor today.

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MANUFACTURING CO., INC. CEDAR RAPIDS, IOWA, U. S. A.

Cable-operated Scrapers in 6-, 8- and 14-yd. sizes for all makes of track-type tractors.

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Hydraulic and Cable-operated Dozers.

Test-Road Project Nearing Completion

Stage Set for Experiment as Contractor Lays Bituminous Test Road for WASHO in Southern Idaho

• JUST 2 miles north of the Utah-Idaho state line on U. S. 191, an experiment of vital importance to everyone interested in highways is under way. Highway engineers, trucking concerns, suppliers of road-building materials, and road-user groups may base many of their future actions on the outcome of this work. For it will give some of the answers to the question—what happens when an asphalt highway is subjected to various loads?

The experiment, which is officially called the WASHO Road Test, is a jointly conducted affair under sponsorship of the highway departments of California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, Utah, Washington, and Wyoming, who pooled funds to make up $285,000. This will cover the cost of construction of the test facility and a part of the cost of the test. Other cooperating agencies include the Bureau of Public Roads, which is contributing certain supplies, equipment, and personnel with an estimated value of $70,000; truck manufacturers of the Automobile Manufacturers' Association who have tentatively agreed to furnish the test trucks; trailer manufacturers who will furnish the trailers; and certain companies in the petroleum industry which will furnish the gasoline, oil, and grease for the test. The total cost of the undertaking is estimated at over $500,000.

The Highway Research Board of the National Research Council has been supervising construction of the experimental test road, and its technicians will also conduct the truck tests. The WASHO test is unique in one respect: the road is built from the ground up, so that much of the data on the natural condition of subgrade and subbase materials will be more complete than for Road Test One-MD in Maryland in 1950-51. (See C. & E. M., Sept., 1950, pg. 10; April, 1951, pg. 4; and July, 1952, pg. 8.)

The contractor whose low bid won the important project is the Carl E. Nelson Co., of Logan, Utah.

Project History

In March, 1950, the Executive Committee of the Western Association of State Highway Officials met in Salt Lake City to talk over the desirability of building a bituminous test road which would simulate western conditions, and testing it under various axle loads as had been done in the Maryland concrete-road test. When the Standards Committee of AASHO met in December, 1950, in Miami, Fla., the matter was again brought up. The Western Interstate Committee on Highway Policy Problems of the National Council of State Governments also was beating its drums to urge construction of such a highway in the western region.

When WASHO held its 1951 annual conference in San Francisco, a resolution was passed setting up such a test. After much consideration, it was decided that the road should be located in either southeast Idaho, southwest Wyoming, or northern Utah. This area was considered to be representative in climate and soil conditions of large areas of the western country. The Standards Committee of WASHO was asked to pick the exact location and to draw up plans and specifications.

Four Sites Studied

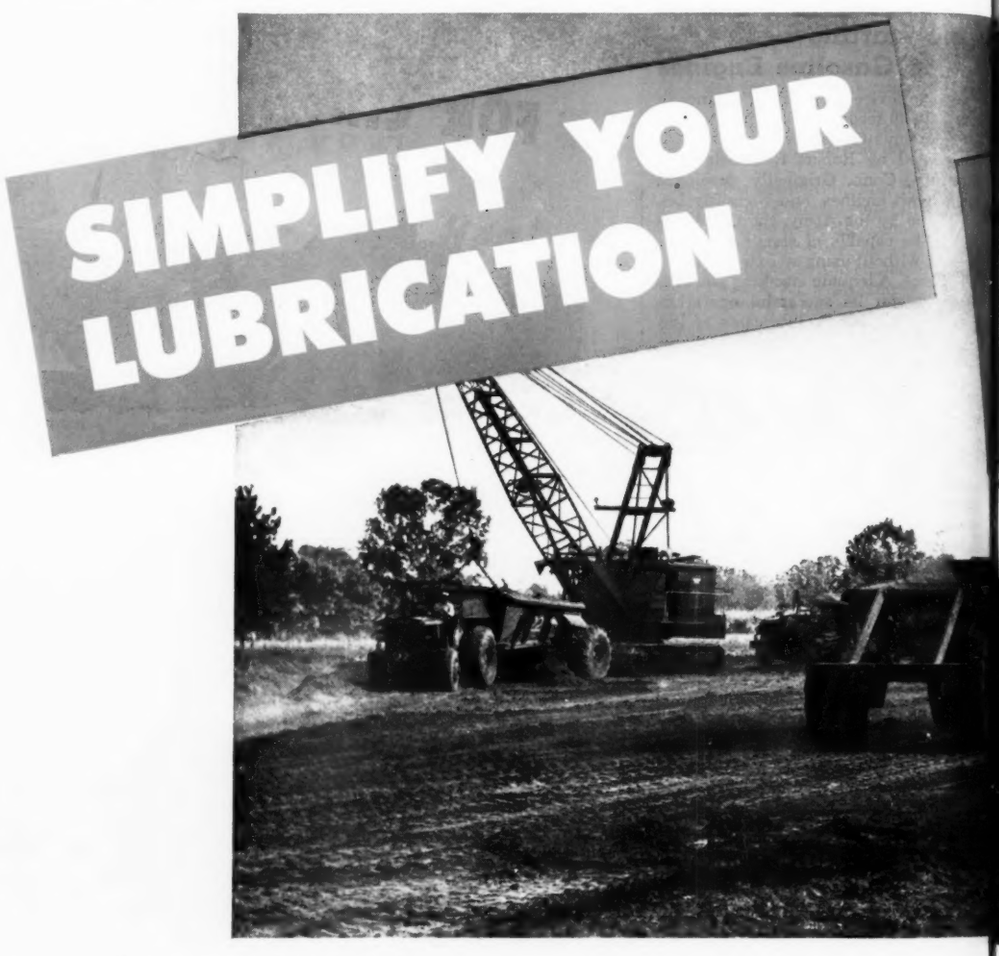
On July 13-14, 1951, the Standards Committee visited four proposed sites. On July 30-31 it met in Boise and selected the present site, which is on U. S. 191 about 11 miles south of Malad, Idaho. The test track is located about ¼ mile west of the existing highway on the right-of-way for a pending reconstruction of this north-south route between Ogden and Pocatello. After completion of the test, the road will be incorporated in the new highway.

The site is in an irrigated farm valley 2 to 3 miles wide between two small mountain ranges which once formed the shore line of ancient Lake Bonneville. The valley is at an elevation of about 4,400 feet. The annual precipitation averages about 15 inches, with about 1 inch during the summer and the balance coming as snow during the winter months. Temperatures range from 100 degrees F in the summer to minus 20 in the winter. Normally the frost penetration ranges between 18 and 36 inches, with 24 inches a fair average. A heavy snowfall last winter made frost penetration less than normal.

The soils at the site are silt loams bordering on silty clay loams. They are so fine that it's a standing joke that Utah isn't angry that the Beehive State didn't get the road, because it's built on Utah soil anyway: soil which blew north in the prevailing winds. In the HRB classification system they are near the upper limit of the A-4 group, with lower limits in the A-6 group, and group indices of 8 to 9. They are calcareous in nature, but the calcium-carbonate content is not high enough to justify classification of these soils as caliche.

The soil deposit is either alluvial or wind-deposited, or alluvial modified by wind action. The in-place structure is characteristic of wind-deposited soil. An inspection by the U. S. Department of Agriculture indicated that all the Malad River soils are probably associated with the Bancroft and Lanark series. Laboratory tests on soils from the test location indicated a rapid capillary rise and moderate volume change for moisture contents slightly below the optimum.

A gravel deposit near the site was used for the variable-thickness subbase course. This pit was reasonably uniform with a top size of 2 inches, the small amount of oversize material was crushed to 2-inch maximum. Material from this pit was also crushed to a top size of ¾-inch for the base course. The crusher-run material, ¾-inch down in size, was also found to be satisfactory for the asphaltic-concrete surfacing.



Contractors in all parts of the country are saving time and money with the Texaco Simplified Lubrication Plan. They've reduced the dozens of competitive lubricants they formerly used to *only six* Texaco Lubricants — the few they need for all their major lubrication jobs. This not only saves time and work but — more important — it prevents confusion and costly lubrication errors.

6 Products Used in Texaco Simplified Lubrication Plan

1. Engine Lubrication: Use *Texaco Ursa Oil X*** for both heavy duty gasoline and Diesel engines. It's detergent and dispersive — cleans as it lubricates. Tops for protection against wear and rust. Reduces both maintenance costs and fuel consumption.

2. Chassis Lubrication: Use *Texaco Marfak*. It gives longer lasting protection against dirt, rust and wear because it won't jar out, won't squeeze out. *More than 400 million pounds of Texaco Marfak have been sold!*

3. Wheel Bearing Lubrication: Use *Texaco Marfak Heavy Duty*. It seals out dirt and moisture, seals itself in — assuring longer bearing life, safer braking. No seasonal change required.

TUNE IN: On television — the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.

TEXACO

TEXACO

Design Description

In designing the test road, the WASHO Standards Committee tried its best to come up with a section which will develop the maximum amount of useful data within available funds. The Committee knows that the Malad test road will not provide all the loading answers on a bituminous highway, but the design was made to give as many as possible. Detail design work and the preparation of plans based on the Committee's criteria were done by the Idaho Department of Highways. In general, standard Idaho specifications have been used to govern construction.

The layout consists of two separate loops with tangent sections 1,900 feet long and 24 feet wide. The tangents in each loop are connected by superelevated turnarounds, which will let the test trucks operate at a constant speed of about 30 mph. The two loops are separated by a service area approximately 600 feet long. In this area will be located a field office, truck-maintenance facilities, instrument storage, weighing equipment, and aggregate stockpiles.

Ray Day Photo

A Bucyrus-Erie B-250 scraper, loaded with dirt, comes in behind a D8 to one of the fill areas on Idaho's experimental bituminous road.

The pavement in the tangents of these test loops is varied in thickness. On one tangent in each loop the top 6 inches is made up of 2 inches of asphaltic concrete over 4 inches of ¾-inch granular-base material. In the other tangent of each test loop the top 6 inches consists of 4 inches of asphaltic concrete over 2 inches of granular base material. Thus, all four tangents have a 6-inch thickness of asphaltic concrete plus base. Each of the four 1,900-foot tangents is broken down into five 300-foot test sections with 100-foot transitions between the test sections. The only difference between these sections is in the thickness of 2-inch-down pit-run granular base material. One section in each tangent has 16 inches of granular base material, the next 12 inches, the next 8 inches, the next 4 inches, and the remaining section is laid directly on the subgrade soil. Thus, the total thickness of pavement over the subgrade soil varies from 6 to 22 inches on each of the 4 test tangents. In order to reduce delays caused by pavement maintenance, the turnarounds are all 22 inches thick. Three special test sections 200 feet long have been provided to study the behavior under heavy traffic of surface treatment, and of two thicknesses of road-mix bituminous surfacing.

For the purpose of the test, the 24-foot width of the tangents is considered as two separate 12-foot lanes. The outside lane will be tested under the heavier vehicles and the inside lane under the lighter vehicles. Since the two lanes will be built at the same time on identical soils and under identical conditions, it will be possible to compare directly the behavior of the outside lane with that of the inside lane. Differences in the behavior of one lane as compared with its adjacent lane can be attributed directly to the difference in axle loads, according to HRB officials in charge of the construction.

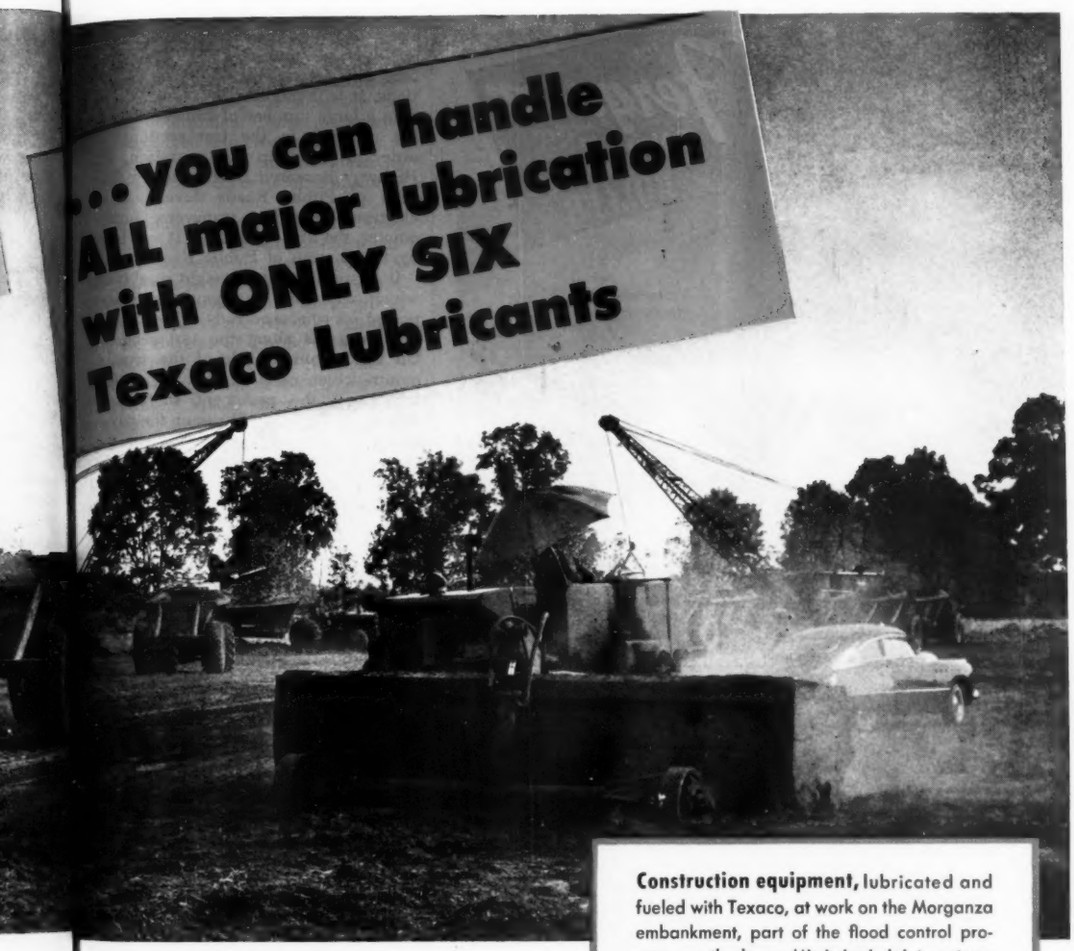
Grading Gets Under Way

On April 15, shortly after Nelson's contract was awarded, men and equipment started moving in to push the grading along as rapidly as possible, so that construction could be finished by the end of August; but, as it turned out, it will be some time late this month before construction and installation of all the measuring instruments is finished. Even so, with luck, some testing can be done during October.

Nelson's grading fleet consisted mostly of tractor equipment, since many of the hauls were reasonably short. There were three Caterpillar D8's which pulled a Bucyrus-Erie B-250 and two LeTourneau FP Carryalls, two LeTourneau sheepsfoot rollers, two water-tank trucks, and a few extra Cats for dozer work. Pusher tractors were not necessary because of this typical soil analysis:

Class	HRB Type A-4
Liquid Limit	32
Plasticity Index	7
Optimum moisture	23 per cent
Maximum dry density	95 lbs/cf
Shrinkage	4 per cent
Gradation:	
Passing No. 10	99 per cent
Passing No. 40	95 per cent
Passing No. 200	83 per cent

(Continued on next page)



Construction equipment, lubricated and fueled with Texaco, at work on the Morganza embankment, part of the flood control program on the lower Mississippi. Joint contractors are Edward E. Morgan Co., Inc., and Jones & Gillis, Inc. Dirt-moving operations, started in June, 1949, call for placing 3,985,000 cubic yards of semicompacted embankment. Equipment includes 4 draglines, 9 tractors and 53 trucks — all of which are lubricated with Texaco exclusively.

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FOR ALL CONTRACTORS' EQUIPMENT

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Test-Road Project Nearing Completion

(Continued from preceding page)

The grading plan consisted generally of building the tangent sections about half on fill and half in cuts, and the turnarounds on fill. Since the work was part of a carefully controlled test facility, and since the Highway Research Board was taking advantage of its opportunity on this project to study subgrade conditions in advance, the progress of the work was not spectacular. The tractor equipment simply worked along in a conventional manner, and the soil was compacted when enough moisture had been added to bring the content up to optimum. Densities of 93 to 95 per cent of optimum were built into the earthwork as it progressed.

Blading of slopes, and leveling of dirt on fills was handled by a No. 12 Caterpillar motor grader. Later on, a Cedarapids Master Tandem rock plant moved in to crush the subbase material. The hot plant is a Madsen, and Barber-Greene finishers are laying the asphaltic concrete.

Ray Day Photo

Two dirt-laden LeTourneau Carryalls move like beetles toward the turnaround area.

Extensive Instrumentation

Instrumentation in the test road is probably the most extensive ever installed in a piece of new construction, and in addition to the usual strain gages, temperature recorders, and other such devices, some new equipment not tried before is being developed.

For example, an excellent basis of comparison of the behavior of the various design sections will be their surface displacement under traffic conditions. It will therefore be necessary to take a large number of transverse profile readings in the test sections. In order to speed up this operation, the Highway Research Board and the Bureau of Public Roads developed an electronic-recording transverse profilometer, the first of its kind. It was built by the Bureau of Public Roads.

It consists of a lightweight rigid truss which will span the pavement, supported on reference rods driven at 60-foot intervals along the test sections. On the bottom chords of the truss a motor-driven carriage will ride a few inches off the pavement surface. A small wheel which will run on the pavement surface is suspended from the carriage by means of a linkage which will let the wheel move up and down, following the movement of the pavement surface. This profile movement will be measured and recorded electronically.

Since the reference rods at the edge of the pavement support the truss in a definite fixed position, a comparison of profiles taken before test traffic started with those taken during and after the test will indicate to a high degree of accuracy any changes in the elevation of any point on the pavement surface.

The profilometer will also be used to measure changes in the elevations of points located at the top of the subgrade and at the top of the subbase. Small perforated plates were placed in the pavement during construction. When it is desired to determine the location of these plates, rods will be lowered through ½-inch holes in the pavement and screwed into the plates. The rods will extend about an inch above the pavement, and using the profilometer carriage as a reference plane, it will be a simple matter to determine the plate elevations. Several such points can be checked periodically on two transverse lines in each test section. From these records, it should be possible to draw profiles of the top of the subgrade and top of the subbase which, combined with surface profiles, should provide valuable information as to the relative damage to the pavements caused by the various loads.

But these records will show only the permanent structural changes in pavement. Experimental work on flexible-pavement behavior at Hybla Valley, Va., has indicated a probable correlation between pavement failures and the elastic or dynamic movements within the pavement structure under the moving loads. For this reason, the Highway Research Board has also developed instruments which, installed in the pavement, will measure the deflec-

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Ray Day Photo

Here comes a Caterpillar No. 12 motor grader. It's working on one of the cross drains on the WASHO test road.

tion directly underneath the tires as the truck moves over them. These instruments have been devised so that the total movement of the top of the pavement can be recorded simultaneously with the compression in the pavement structure itself, consisting of surface, base, and subbase. By simple arithmetic, using these data, the movement of the top of the subgrade can also be determined. These movements are transferred into electrical energy so that useful records can be made by linear-variable differential transformers.

The method of installation, along with corollary equipment, has been under development for over 2 years at the joint project at Hybla Valley, Va., under joint sponsorship of the Highway Research Board, the Asphalt Institute, and the Bureau of Public Roads.

In addition to their use for measuring relative behavior of the various sections under loads, these instruments may prove useful for forecasting future pavement failures. It seems certain that they will be used to determine the effects of varying vehicle speeds and the effect of loads outside the range of the loads in the test.

One of the toughest problems was the design of a simple mechanism which would tell a truck driver when to change his transverse position on the test road. To simulate normal traffic movement, drivers must frequently change positions and follow certain longitudinal guide stripes painted on the pavement. To get rid of the human equation, the HRB and BPR technicians had to design something which would flash a code light in the truck cab. The best solution so far is a simple radio receiver in the cab, which operates a relay when it receives a certain radio signal beamed across the road. This in turn will activate a stepping switch, which will move up one position and flash on the right code light for the driver to see.

In addition to the instrumentation necessary to measure the test pavement's behavior, certain control tests and measurements were made during construction to assist in later evaluation of the data. Materials used in construction were rigidly controlled to make the test pavement uniform. Standard procedures were used in these tests, and the only departure from ordinary construction testing was in the number of determinations made.

In order to provide a continuous record of temperature and moisture at various depths in the pavement, moisture cells and thermistors were buried at strategic locations around the project. These will be read as often as necessary to determine significant changes in the pavement temperature and mois-

(Continued on next page col. 3)

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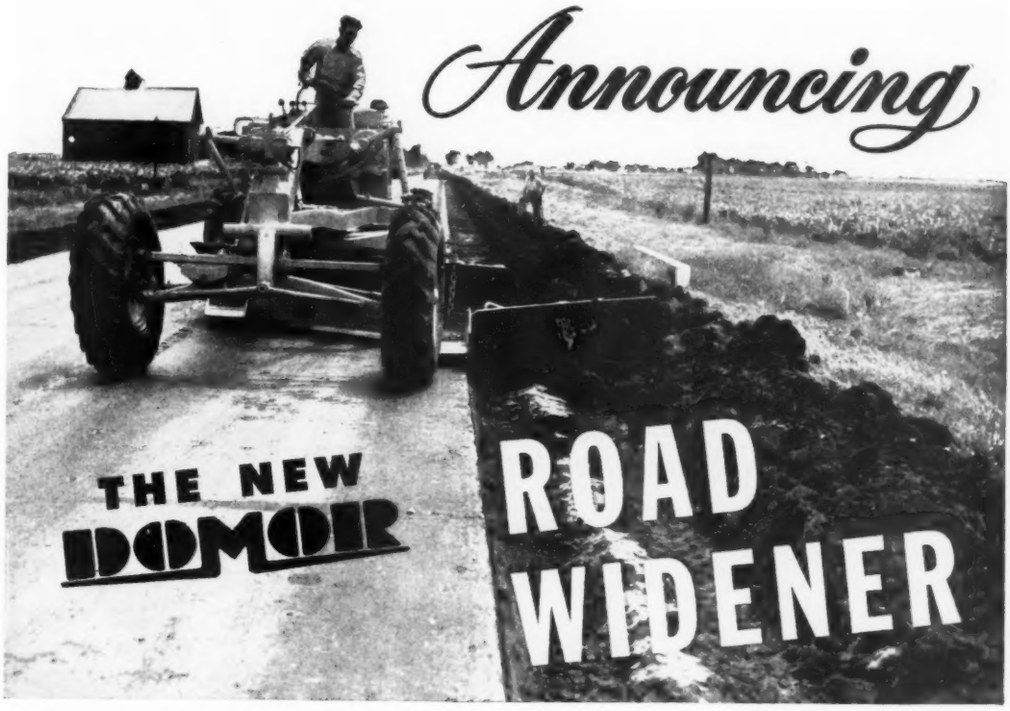

Two blade passes and two passes with the Domor Road Widener produce a trench that is level, clean, compacted and ready to take concrete. Pouring of excess concrete is eliminated. This unit is working on Jansen & Schaffer's Rt. 116 project in Ill.

Quickly attached or detached, the Road Widener is operated by regular Grader controls and is adjustable in depth and width. Note clean edge of old pavement and trench bottom — no undercutting necessary.

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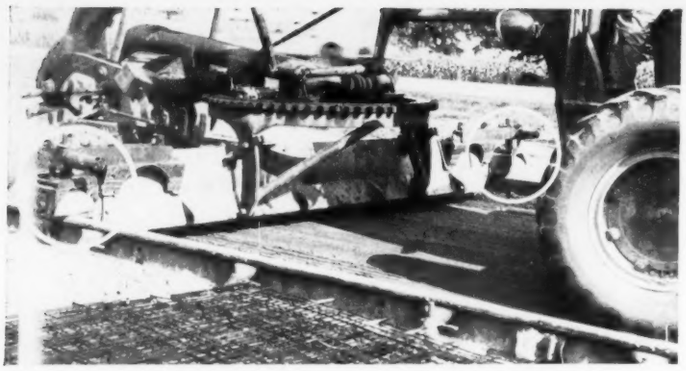

FINEGRADER—Fast, Flexible, Most Accurate

The Motor Grader illustrated above is equipped with Roadgrader Gauges and is shown finegrading a 12-foot-wide lane on a highway project.
Quickly and easily attached to the moldboard, Roadgrader Gauges fit all standard makes of graders and do not interfere with other operations. For further information write to

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Test-Road Project Nearing Completion

(*Continued from preceding page*)

ture. The asphaltic mixture for the surfacing material was designed in one of the state laboratories, as were acceptance tests for the bituminous materials. Careful records of the weather were maintained. Static plate-bearing tests were also made during construction. A complete photographic record of all operations, including a moving picture, was made by the Bureau of Public Roads as a part of its contribution.

As soon as construction and instrumentation is complete, truck operation will begin. The method of operation and early indications of results will be detailed in a subsequent article in CONTRACTORS AND ENGINEERS MONTHLY. Plans at the present time contemplate use of single-axle combinations on the north loop, with 18,000-pound loads running on the inside lane and 22,400-pound single loads running on the outside lane. On the south loop, tandem combinations will be used with 32,000-pound tandem-axle loads on the inside lane and 40,000-pound tandem-axle loads on the outside lane. Two vehicles will operate in each lane; thus the test will require 8 tractor-trailer combinations.

Personnel

The project is under the general supervision of Fred Burggraf, Director of the Highway Research Board, with W. N. Carey, Jr., of the Board's staff, as Project Engineer. Major policy matters are decided by an Advisory Committee of the Board made up of representatives of the participating agencies with E. V. Miller, State Highway Engineer of Idaho, as Chairman. A. F. Rath, Resident Engineer of the Arizona State Highway Department and now on leave to build the road, is Resident Engineer. Professor Harold S. Sweet, on leave from the University of Wyoming, is Engineer of Tests.

When the test traffic starts, Theodore Dec, on leave from the Bureau of Public Roads, will be in charge of operation of the vehicles. Field construction operations for the Carl E. Nelson Co. were directed by William Hanserd, General Superintendent.

Weed Killer Bulletin

A new service bulletin on the uses of Penite 6, a nonselective weed killer, has been prepared by Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia 7, Pa. It gives instructions for top-growth and aquatic weed control and explains soil-treatment methods to be employed for a complete kill of weeds and grasses. The bulletin points out that Penite 6 may be used, too, for termite control, debarking, and tree and stump killing, and it gives formulations for preparing the proper solution for each use.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 579.

Smith Appoints Dallas Head

A. O. Smith Corp., Milwaukee, Wis., manufacturer of industrial grating and heating equipment, has appointed John J. Redmon Manager of its Product Service branch at Dallas, Texas. He succeeds Ben Heald who is returning to full-time sales activity for the company.

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Photogrammetry: A New Tool for Engineers

Topographic Maps Produced by Photogrammetric Methods Are Boon to Highway Men; Inexpensive, Fast, Accurate

By A. O. QUINN
Aero Service Corp.,
Philadelphia, Pa.

• PHOTOGRAMMETRY has passed from a preliminary and experimental stage to the status of a reliable scientific tool that engineers are finding invaluable for planning purposes. Prior to World War I, it was regarded as a plaything of our European friends, and this country was slow to recognize the practical applications of it being made in Germany, France, Italy, and Switzerland. Our military intelligence experts, however, foresaw its reconnaissance possibilities, and after the war a number of pilots ventured their capital to form organizations that would search for additional ways to utilize aircraft in peacetime operations.

The period between World Wars I and II, and particularly the crash of 1929, was rough on the development of new ideas, because financial crises always produce wary and skeptical business men. The small aerial companies kept alive by carrying mail, taking inquisitive people for Sunday rides, and occasionally snapping pictures for industrialists and government agencies. But in 1933 the Tennessee Valley Authority, staffed by an outstanding group of engineers and scientists, entered into a large aerial photographic and mapping program, and the speed and accuracy of results prompted other agencies to study the methods used. (An interesting review of the beginnings of photogrammetry and a description of three of the major companies is contained in the June, 1952, issue of *Fortune*.) World War II, with its global requirements for mapping, charting, and intelligence, removed any lingering doubts as to the validity of aerial photographic methods; and since the war we have entered into a phase of tremendous development and use of photogrammetry.

Growth of Equipment

Production of maps that can be used by engineers has required a vast amount of research in photographic equipment, mapping instruments, and cartographic techniques. For example, the aerial camera used in mapping work has now become a precision instrument. Its essential parts are the same as in your own camera—lens, shutter, film, and winding mechanism. However, in mapping techniques the the slightest distortion of the camera lens becomes a troublesome source of error, and the research of the past few years has produced a far better lens, in which all distortion values are known. In fact, a virtually distortion-free lens is now being produced and it is hoped that this new development will be available in the very near future. The seating of the lens must be precise, too, in order to maintain a constant focal length.

The photographic medium was originally glass plates, but the development of the roll film in 1890 was a great help in simplifying aerial photographic problems. The big disadvantage of film has been unequal distortion, but research has kept pace with the requirements and a more stable film base has been produced to keep film-shrinkage problems at a minimum. The aerial camera must also have the means of keeping the film absolutely flat at the instant of exposure, and collimation marks which appear on each photograph must be precisely placed. Auxiliary equipment to level the camera, a view finder, and occasionally an automatic exposure device have been incorporated in the new cameras.

The aerial photograph is the foundation of all the subsequent mapping work, and unless the photograph is produced by a calibrated and tested camera in the hands of a thoroughly competent photographic crew, it cannot be used successfully for precision mapping. And do not undervalue the importance of an experienced photographer and pilot. The best instruments cannot be expected to perform properly unless they are handled by experts in the field.

Map Production

Transforming into a map the immense amount of information contained on the photograph is the next step. This is done by combining analytical and mechanical solutions of a spatial geometry problem.

Aerial photographs are exposed so that a portion of the area of each photograph is included also within the field

(*Continued on next page*)

A BIGGER Compressor for your air tools

Here it is . . . biggest and most powerful of all Blue Brute Portable Compressors! This 600' unit *really* costs less to operate, with its *low* fuel consumption and the *minimum* maintenance it calls for.

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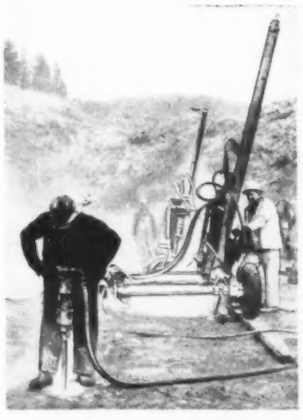
There's even more you'll want to know about this new portable compressor. Write for Bulletin H-850-B74 to Worthington Corporation, Construction Equipment Division, Plainfield, N. J.



ENOUGH AIR IS LEFT OVER in this hookup with the new Blue Brute 600' and with two 4-inch wagon drills to operate the heavy-duty rock drill in foreground!

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Photogrammetry: A New Tool for Engineers

(*Continued from preceding page*)

of view of each successive photograph in a strip. In fact the forward overlap is usually approximately 60 per cent, and between adjacent flight lines the sidelap is about 25 per cent. Overlap is secured in order to achieve the phenomenon known as "stereoscopic vision", or the ability to see the third dimension. Our two eyes provide this effect by viewing an object from two slightly different points of view so that images of two impressions are transmitted to our brain. There a fusion of the images takes place and we receive an impression of depth—the third dimension. In photogrammetry we temporarily substitute for our eyes aerial photographs taken several thousand feet apart, and when the photographs are oriented properly we see the hills and valleys in their relative heights and depths.

Stereoscopic Plotting

The stereoscopic plotting instrument combines our ability to see stereoscopically with a precise method of measuring the third dimension. In the plotting instrument it is necessary to orient the aerial photographs in exactly the same positions they occupied at the instant of their exposure in the airplane camera. This is accomplished by referring to established ground controls—horizontal positions (which control scale relationships) and elevations (which assist in recovering the exact tilt of each photograph). The ground-survey points must be identified on the photographs and are known as "photo-control points". This identification requires the services of highly skilled surveyors who are specially trained for this type of survey work.

The operator of present-day precision stereoscopic mapping instruments is a highly trained and skilled person. He must have a thorough knowledge of his equipment and of topographic mapping, and the technical ability to solve the problems of photogrammetry. His ocular acuity must be far above average (this can be achieved in a large measure by training). He must be a fair draftsman, a photo interpreter, and a mechanic (the instruments occasionally do not function properly).

The mapping instruments range in cost from $6,000 to $50,000. The latter are used in the most precise work to establish control by photogrammetric rather than strictly ground-survey methods.

Accuracy and Planning

The accuracy of a topographic map produced by photogrammetric methods depends on a great many factors—the altitude of the aircraft, the camera, the ground survey, the plotting instruments, and above all the experience and knowledge of the personnel operating the equipment. The National Map Accuracy Standards which have been adopted by our various government agencies require that 90 per cent of the contours on a map should be within one-half the contour interval. For example, on a map showing 5-foot contours, 90 per cent of the contours should be within 2½ feet. For horizontal position, 90 per cent of the well defined map features should be within ⅓₀ inch at the final map scale. That means that if the 5-foot contour map just mentioned is at a scale of 1 inch equals 200 feet, 90 per cent of the points should be correct to 5 feet. These accuracies can be obtained in areas that can be clearly viewed on aerial photographs, but in places obscured by trees, heavy shadows, etc., the accuracy requirements must be changed. Topographic maps having contour intervals of one foot at a scale of 1 inch equals 40 feet have recently been prepared for one eastern state highway commission. The accuracy required was that 90 per cent of the contours be within ½ foot! The highway commission rigidly checked the maps and accepted them as complying with the specifications. Usually highway maps are prepared for 2-foot contour intervals at a scale of 1 inch equals 100 feet, and 5-foot contours at a scale of 1 inch equals 200 feet.

Before ordering a topographic map, it is most desirable to consult with representatives from reputable mapping organizations in order to review the problems to be encountered, the costs, and the relative accuracies that are required for a particular job. Photogrammetric mapping is a professional engineering service. The map should be tailor-made to fit the exact requirements, and acceptable results are best obtained through the services of highly trained and thoroughly competent specialists in the problems of photogrammetric engineering. The entire mapping program must be planned. "Any old photographs" cannot be used. The contour interval to be mapped largely determines the altitude of the photography, and photographs planned to produce 25-foot contours in general cannot be used for 5-foot contours. Good planning can save time and money.

Help for Highway Engineers

Highway-design engineers throughout the country are discovering that aerial mapping methods can produce topographic maps covering far larger areas than would be possible from ground surveys, at a relatively low cost (approximately $800 to $1,200 per mile for 5-foot contours at 1 inch equals 200 feet) and within a short period of time. Now it is possible to give economic study to a number of alternate routes; drainage and runoff investigations can be made through the use of wider bands of topographic maps and aerial photographs; and minute route research through congested areas can be made

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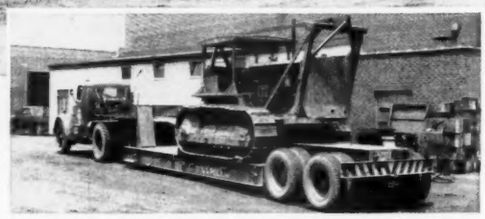
Figure the man hours you're spending right now to load and unload your equipment . . . using ordinary methods. Multiply it by the number of moves you make each day. NOW . . . DIVIDE that figure by two, and you've the extra hours you'll keep your machine on the job . . . producing for you . . . when you make your moves with a Martin "Folding Gooseneck" Trailer! Your operator handles the entire job alone. No need to tie up a man at the truck. No blocking, cribs or ramps to build. No cross loading. The "Folding Gooseneck" Trailer forms its own loading ramp. Trailer is low built for safety . . . low clearance . . . stability.

COMPARE THESE FEATURES:

• FAST PICKUP by truck power . . . truck winch does all the lifting. One man handles the job . . . effortlessly. • RUGGED . . . heavy-duty construction. • SAFE . . . large air, vacuum or electric brakes for sure stops. • Backed by your MARTIN-"Caterpillar" Dealer service facilities.

MARTIN MACHINE CO., KEWANEE, ILLINOIS, U. S. A.

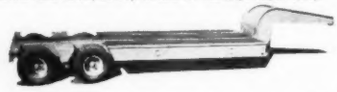


Tully & DiNapoli, N. Y. Contractors, report, "The 'Folding Goosneck' Trailer has greatly increased our operating efficiency. It's dependable and fast."

Make all your moves on Martin Trailers . . . a type and capacity to fit every need. Seven standard models.

Martin Model 333 . . . tandem axle, tilting platform. 10-ton cap. Other models in this class, 10-ton cap. Models 222 and 444.

Martin Model LB2S 11-ton cap. LB3S, similar, 14-ton cap. Front end axle assembly available to convert 2-wheel to 4-wheel trailer. Other trailers in this class; tandem axle LB3T; LB4T, 20 and 27-ton cap. respectively.

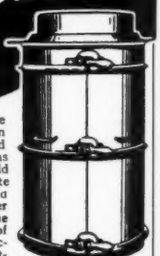


Martin Model R3T . . . rear loading, tandem axle semi-trailer. 20-ton cap. Other models in this class: Model R4T and Model R5T, 27 and 32-ton cap, respectively.

MARTIN Trailer

MARTIN MACHINE CO.
KEWANEE, ILLINOIS, U.S.A.

THE Quinn Standard FOR CONCRETE PIPE



The Quinn Standard is known as the best the world over, wherever concrete pipe is produced and used. Backed by over 35 years' service in the hands of hundreds of Quinn-educated contractors, municipal departments and pipe manufacturers who know from experience that Quinn pipe forms and Quinn mixing formulas combine to produce the finest concrete pipe at lowest cost

QUINN HEAVY DUTY PIPE FORMS

For making pipe by hand methods by either the wet or semi-dry processes. Built to give more years of service—sizes for pipe from 10" up to 120" and larger—tongue and groove or bell end pipe at lowest cost. WRITE TODAY. Complete information, prices, and estimates sent on request.

Also manufacturers
QUINN CONCRETE PIPE MACHINES

QUINN WIRE & IRON WORKS 1645-12 ST. BOONE, IA.

without disturbing entire communities. Continuing development of photogrammetric instruments and techniques is working in favor of lower costs and greater speed of map production.

In addition to the production of topographic maps which are used to lay out highway location without extra field investigation, aerial photographs can in many other ways assist the highway designer. In preliminary investigations for possible routes between two terminals, high-altitude (relatively small-scale) photographs should be obtained. A stereoscopic review of these photographs, together with a topographic map having a large contour interval, will enable the designer to select one or two rather restricted routes for further detailed studies. These studies can be made from lower-altitude photographs and topographic maps prepared by photogrammetric methods.

Recently, extensive investigations prompted by military photo-intelligence experts have made it possible to investigate soil and rock conditions from photographs, and in the preliminary studies mentioned above, it is possible to make reliable determinations of all conditions to be encountered along a proposed route. These studies should not be neglected in highway planning of new routes.

Very-low-altitude photographs taken by a special-type camera known as the Sonne camera have been used to study the wear and tear on highways between stated time intervals. Traffic investigations involving traffic counts, movability, urban and suburban parking, etc., can best be handled through the accurate medium of a permanent aerial photographic record. Construction-progress releases for public-relations and legislative reviews can be easily and graphically prepared with the help of aerial photographs. A well annotated aerial mosaic of a proposed route can show law-makers in a simple understandable way the salient facts, which in many cases are lost in the details of an involved engineering report.

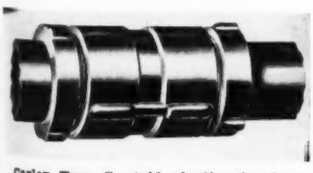
These are only a few of the many practical applications of aerial photographs to highway engineering. Further study will certainly suggest other problems that could be solved the easy way —by using photographs.

Photogrammetry has arrived and is available to assist in the solution of highway problems. One of the best ways to keep track of the developments in this most interesting science is through the American Society of Photogrammetry. Members of highway associations should join this organization, receive its publication, and participate in its meetings.

Rigid Plastic Pipe Has Higher Strength

An improved rigid plastic pipe and a new compression-type coupling are said to have high tensile and flexural strength plus increased resistance to burst, chemicals, and sunlight. They are announced by Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio. They also feature light weight, ease of handling, and resistance to rot, rust, and electrolytic corrosion.

Carlon Type L rigid pipe is recommended by the company for cross-country piping, land drainage, and processing on exhaust lines handling highly corrosive fumes, gases, and vapors. It can be used for suction lines, and as conduit in underground, underwater, and concrete-embedded electrical installations.



Carlon Type L rigid plastic pipe has been improved for greater strength and greater resistance to burst, chemicals, and sunlight.

The improved pipe features an ultimate tensile strength of approximately 6,000 psi and an effective tensile for piping applications of 3,600 psi at room temperature. Flexural modulus is 250,000 psi and impact is 4.3 Izod (notched). Burst pressure varies according to pipe diameter (1-inch diameter has burst pressure of over 1,000 psi).

The Carlon L plastic pipe is supplied in 10 and 20-foot random lengths which can be connected quickly by means of the new compression-type coupling or by slip-sleeve tees and ells. A rubber gasket provides a leakproof joint. The new coupling compensates for expansion and contraction. The slip-sleeve ell and tee fittings have an interior shoulder to which the pipe is butted. A special cement is applied to the outside of the pipe and the throat of the fitting to assure a leakproof joint.

The pipe is available in standard sizes from ½ to 2 inches. Threaded adapters can be furnished for connecting the pipe with previously installed metallic piping systems.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 608.

Portable Cutting Tools

A new catalog on a line of portable cutting tools has been released by Manco Mfg. Co., Bradley, Ill. It describes and illustrates the complete series ranging from lightweight hand cutters to large high-capacity bolt cutters. Units for cutting steel rod, wire, fence, strapping, high-tension wire, and similar materials are also listed.

The literature may be obtained from the company. Or use the Request Card at page 16. Circle No. 553.

R. C. Brower of Timken Dies

R. C. Brower, Secretary-Treasurer and Director of Timken Roller Bearing Co., Canton, Ohio, manufacturer of roller bearings and detachable bits for drills, died July 13 at the age of sixty. He joined the company in 1923 as Assistant General Manager of the Service Sales Division.

John A. Riley, with Timken since 1925, succeeds Mr. Brower in the post of Secretary-Treasurer.

MOVING THE EARTH... *to build air power*

Eight hundred thousand cubic yards of earth had to be moved before a new 9,500-foot runway could go in at Montana's Great Falls Air Force Base. And it had to be moved in a hurry.

Three big new "Cat" DW21 Tractors with No. 21 Scrapers helped speed the job. Push-loaded by "Caterpillar" Diesel D8 Tractors, these husky work horses loaded 15 to 20 cubic yards each in as little as 40 seconds, with haul cycle times of only 4 minutes for a 1,000-foot haul, 15 minutes for 5,000 feet. And Nilson-Smith Construction Co. kept them highballing like that for 20 hours a day.

That sort of service is routine for these high-speed "Cat" DW21s. The powerful Diesel engine delivers 225 HP at the flywheel and moves the giant 2-wheel tractor at 20 m.p.h. Crown shaved, "Hi-Electro" hardened final drive gears . . . strong, welded steel transmission . . . big 22-inch-diameter air-activated brakes that can be independently operated for walking out of soft spots . . . these are a few of the DW21 Tractor features. The No. 21 Scraper handles 20 yards heaped, 15 yards struck. It's self-loading, or it works smoothly with push-loading tractors, dragline, shovel or clamshell — and it empties even the stickiest materials in a hurry. Its big, low-pressure tires keep the load on top of soft fills, maintain low rolling resistance, give longer tire life.

There's more to the DW21 story. Your nearby "Caterpillar" Dealer can give you the details. See him . . . today!

CATERPILLAR TRACTOR CO., PEORIA, ILL.

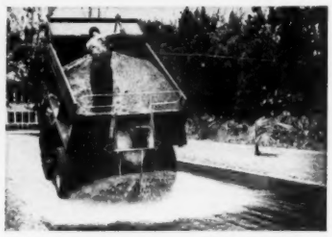
CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

MODEL W HIGHWAY SPREAD-ALL

The above shows the Model W Hi-Way Spread-All which has recently been developed and has gone through many actual tests in the past year. Today we feel it is by far the most outstanding spreader of its kind on the market; the entire mechanism can be driven from an auxiliary gasoline engine, or from the power take-off on the truck, or through a V-belt drive on the drive shaft of the truck. It is available in different sizes to fit all of the different lengths of trucks. The clutches to throw the mechanism in and out of gear are controlled from within the cab by either vacuum or air controls, and the feedgate adjusting the amount of material to be spread is controlled from the cab of the truck, thus making this a one-man-unit. Notice the streamlined appearance.



MODEL DD TAILGATE SPREADER

Here is the economical *all-purpose, all-weather* Spreader—used in the summer for dust control and for seal coating, and in the winter for spreading sand, cinders or rock salt on icy pavements.

Model DD fits any standard dump truck body and can be attached or detached in one minute. It gives a uniform spread 4 to 60 feet wide, at 1 to 35 miles per hour. *Model DD* will give you years of economical, trouble-free service.

Sold by leading distributors throughout the U.S., Canada and many foreign countries

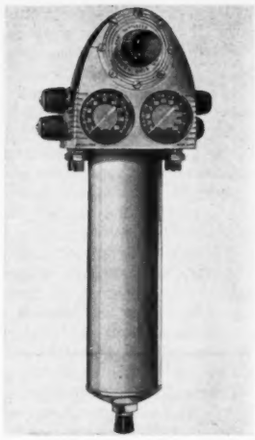
HIGHWAY EQUIPMENT COMPANY, INC. CEDAR RAPIDS, IOWA, U. S. A.
MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

New Air Transformer

A two-stage air transformer which provides fingertip adjustment has been introduced by DeVilbiss Co., Toledo, Ohio. A knob actuates a small pilot regulator which in turn operates the diaphragm of the large regulator. The two-stage regulator also provides for close pressure regulation and low pressure loss.

Oil and moisture are eliminated in the HLD because it traps the liquids and delivers clean air to all outlets. In tests, it removed 97 per cent of entrained water from 100 cfm of air at 100-pound pressure. Oil and moisture captured in the condenser tube are easily drained by a pull-push drain knob. Pulling the knob down closes the drain and pushing it up opens it. The transformer has two regulated air outlets and two unregulated. It has a capacity of 100 cfm.

The head of the transformer housing the regulator, two pressure gages, and valves is a zinc die casting, as is the regulator cap. Gaskets at the top and bottom of the condenser chamber prevent leakage. The separating mechanism is a mechanical disk-type filler. The diaphragm is made of rubber composition with a single fabric insert.

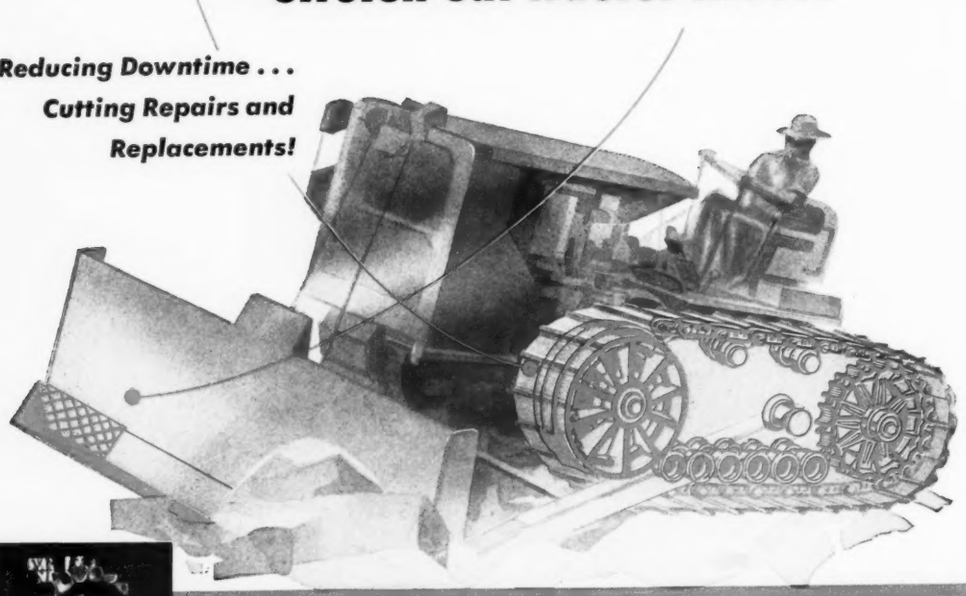


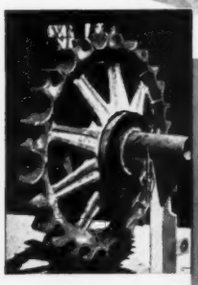
Fingertip adjustment regulates this 2-stage air transformer made by DeVilbiss Co., Toledo, Ohio.

Further information may be secured from the company. Or use the Request Card bound in at page 16. Circle No. 628.

Where STOODY ALLOYS stretch out tractor life...

Reducing Downtime . . . Cutting Repairs and Replacements!

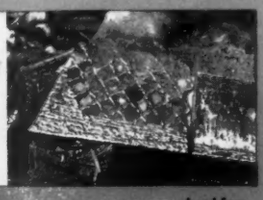




TRACTOR DRIVE SPROCKETS—rebuild and hard-face manually with Stoody Self-Hardening or Stoody 1027 to original size . . . rough grind high spots only . . . *gives service equal to new parts.*

TRACTOR IDLERS—rebuild and hard-face on automatic welding machine, using Stoody 105 . . . *service equals or exceeds new parts.*

TRACTOR ROLLERS—rebuild and hard-face on automatic welding machine with Stoody 105, *service equals or exceeds new parts.*



BULLDOZER END PLATES—hard-face manually with Stoody Self-Hardening 21 . . . apply cross-hatch or stringer beads, *service life increased 3 or more times.*

BULLDOZER BLADES—hard-face manually with Stoody Tube Borium or Stoody Self-Hardening 21 . . . depending on material handled . . . *doubles service life.*

TRACTOR RAIL LINK—hard-faced with Stoody 104, applied automatically. *Service life equal to new.*

BULLDOZER TRUNNIONS—rebuild and hard-face worn areas with Stoody 1027 applied manually and grind to finish . . . *gives service life equal to new parts.*

TOP CARRIER ROLLS—rebuild and hard-face manually, using Stoody 1027 . . . *service life exceeds that of new parts.*

For detailed procedure on manual rebuilding of tractor parts, ask your dealer for a free copy of STOODY GUIDEBOOK.

A list of custom automatic welding shops prepared to handle crawler maintenance work in your area is available from your Stoody dealer . . . see "Welding Equipment and Supplies" in the yellow pages of your phone book—or write direct to Stoody Company

STOODY COMPANY

11936 E. SLAUSON AVENUE, WHITTIER, CALIFORNIA

Trench Drill Speeds Laying of Pipelines

Patching and maintenance costs have prompted many cities and counties to restrict trenching through roadbeds. Where extensive boring is required for pipeline work, and where trees and obstacles are in the way, the Salem Tool Co. recommends its McCarthy utility-type trench drill.

The unit is swung into a trench and lined up by eye. Small alignment holes are spotted about every 15 feet where crowbars can adjust the line. A level on the machine's base frame trues the vertical alignment. The 6-foot augers are attached to the machine by snapping a drive pin in place. After driving each auger forward, the machine backs itself on its base and two operators insert the next auger.

The McCarthy can handle augers from 4 to 36 inches in diameter. The drill head rotates from 15 to 400 rpm. It has 4 forward and one reverse gear and can drill as fast as 6 feet per minute. The main frame is made of heavy welded channel and is 12 feet long and 2 feet wide. The motor is a 25 to 32-hp air-cooled Wisconsin mounted directly on top of the carriage. A hydraulic unit gives the carriage a travel of 8 feet.

The company points out that the McCarthy is especially useful along boulevards because the auger will bore through or go under large trees.

Further information may be secured from the company at Salem, Ohio. Or use the Request Card at page 16. Circle No. 551.

Where extensive boring is required for pipeline work, and where trees and obstacles are in the way, Salem Tool recommends its McCarthy trench drill.

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"Operation Flush" Prepares New Canal For Water Delivery

Pumps and Flushing Remove Chemical Salts From Soda Lake—A Vital Section of Columbia Basin System

• ENGINEERS of the U. S. Bureau of Reclamation, with many unusual answers to tough irrigation problems in the Columbia Basin hanging like trophies on their belts, now have another. It is the successful removal of a heavy deposit of chemical salts from the bottom of Soda Lake, with pumps and dynamite and a flushing procedure, to let clean pure water reach the first irrigated acres.

When the engineers first designed a path for irrigation water down the Columbia River's ancient bed below Grand Coulee Dam, Wash., they had to whip a problem of economics in the Soda Lake vicinity. This is rough rocky country, almost solid basalt, and costly to dig channels in. It was decided to use Soda Lake as a part of the Potholes East Canal, which carries water from Potholes Reservoir, near the center of the project, to an area close to Pasco.

But Soda Lake is a part of an ancient geological process, hundreds of centuries old, which caused alkaline springs to leach out into the lake bottom. As the water evaporated, it left heavy concentrations of sodium, boron, potassium, magnesium, and chlorine. The crystalline bed varied from 2 to 4 feet in thickness, and the engineers and agronomists realized that if this material was allowed to dilute into irrigation water, it could very easily kill the first crops and even ruin the land permanently.

Methods considered for handling the deposit included a direct mechanical removal of the chemical-laden silt and crystal beds, but this would have called for a 400,000-cubic-yard digging and hauling job in wet muck. A scheme of installing an impervious compacted-earth blanket was studied, but the engineers feared the chemicals would rise through this earth some time in the future. It was finally decided to break up the chemical bed with powder to hurry its absorption in water; to dissolve the materials to a near-saturated solution; to flush this foul material out into a badlands area nearby where it could not contaminate any irrigable acres; and then to replace the solution with fresh water.

When the engineers went back into the history of Soda Lake, they found that attempts had been considered to develop the chemicals for commercial use on a big scale. Had this been done, the job might not have been so extensive.

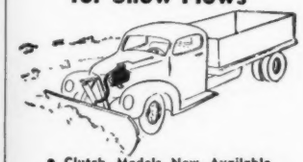
Operations were started in 1951 with

(*Concluded on next page*)

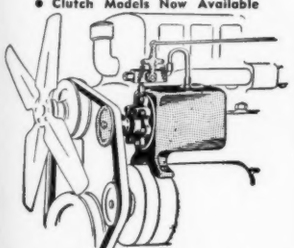
Bureau of Reclamation Photo

Taken from the escarpment at the north end of Soda Lake, this photo shows the pumping arrangement. Three lines extend to different points along the east shore of the lake and three pumps operate through four manifolds and attached hose.

POWER HYDRAULICS for Snow Plows



• Clutch Models Now Available



• THOUSANDS IN USE • FIT ALL TRUCKS
• FAN BELT OR ELECTRICALLY DRIVEN MODELS.
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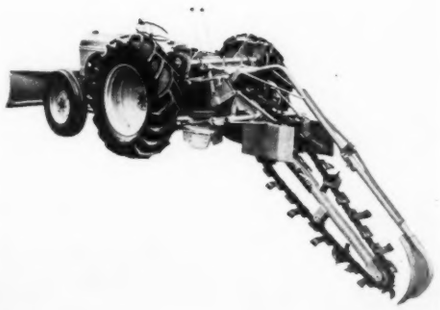
INVESTMENT with ASSURED RETURN . . .

THE *BLACKHAWK* TRENCH HOG



ECONOMICAL

Low initial, operating and maintenance costs mean the Trench Hog pays for itself within a few months. Can be transported under its own power from job to job. One-man operation—one man doing the work of 40, better, faster, more economically. Saves time and money, digs *more* trench at *less* cost!

VERSATILE

Digs trenches as deep as 7′, as wide as 20″. Average digging speeds 350′-400′ hourly. Can dig narrow, shallow trenches 800′ per hour. Furnished with slicer cutters for high speed summer digging, super-service cutters for extremely hard and rocky soils and frozen ground.

DEPENDABLE

Separate speed control for each driver wheel affords perfect control for straight line trenching. Depths precisely regulated by hand or power pump. Rugged construction, quality materials, thorough engineering contribute to consistent performance day in, day out, *every* day for many years.

CALL, WIRE or WRITE *today* FOR MORE INFORMATION

Also ask about the famous Half-Track-Dozer combination for backfilling

Products for Better Farms, Better Industries Since 1920

ARPS CORPORATION NEW HOLSTEIN, WISCONSIN

"Operation Flush" Prepares New Canal

(Continued from preceding page)

a small force-account crew, as further analyses were made by the Boise and Denver offices of the Bureau. The operation of last year was then expanded under a short-form contract with Lee F. Austin Co. of Spokane, Wash., in line with the USBR's current practice of reducing hired-labor work as much as possible. Austin's contract was a rather flexible service instrument which allowed the Bureau to get the work done quickly and well.

Methods Used

The method of removing the objectionable material consisted of jetting holes down through the crystalline formation, and loading about 8 sticks of 40 per cent dynamite into each hole. The dynamite charges were then exploded, breaking up the formation in such a way that its dilution with water was hastened.

The pump hookup permitted lake water to be recirculated until it picked up a high concentration of the material, or to be discharged into the nearby badlands. Pumps included one Pomona deep-well turbine, a Layne, two Binghams, and a Johnson. Large pipe manifolds were connected to an 8-inch discharge line. Recirculation was accomplished through 12 to 14 hose jets connected to the manifold. A program of alternately emptying and refilling Soda Lake was employed, with fresh water coming from Crab Creek.

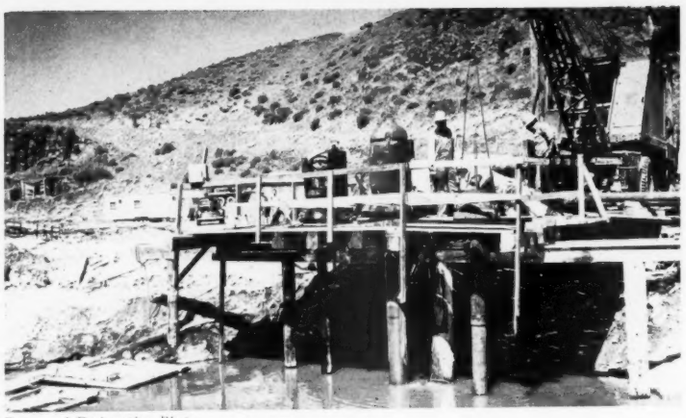
The discharge site was about 3,000 feet away from the pump setup. The pumping head to this disposal area was reduced by laying the 8-inch discharge line through the sluiceway of Potholes Dam, 30 feet below its crest. The input of fresh water from Crab Creek was about 1,300 gpm, while the output of the concentrated solution leaving the lake was about 1,000 gpm. It took some two days of recirculation for fresh water from Crab Creek to pick up its load of chemicals. Work went on 24 hours a day, 7 days a week, and the method had a telling effect. At the time the project was visited, the concentration of salts had already been markedly reduced, and the whole flushing operation was finished by July 31, 1952.

Soda Lake Dike is an earth-fill structure which was completed by Guy F. Atkinson Co. in May, 1951. It will create a greatly enlarged lake whose surface will be 118 feet above that of the present lake. The new lake will cover about 1,500 acres. The pressure of lake water, it is hoped, will repulse further intrusions of the springs which formerly drained into the lake bottom, and they will doubtless plug up or find outlets elsewhere.

When Potholes East Canal is in service, water will be released through the headworks of O'Sullivan Dam, flow a mile through an excavated channel, enter natural channels above Soda Lake, and then pass into Soda Lake itself. From Soda Lake, where the capacity is 3,900 cfs, the water will enter another section of Potholes East Canal to be carried and distributed as irrigation water to about 254,000 acres of irrigable land.

Rapid-Moving Project

Completion of the flushing operation was not a moment too soon, because of the rapid downward advance of water through the basin. There are links in the vast irrigation system left for future construction, but essential parts of the water-delivery network have now been completed to a point where a contractor is working on the tie which links the water to the Pasco Pumping Plant. The 62,500-hp motor-driven pumps at Grand Coulee are now raising water 283 feet, and the water has advanced to points below Quincy and Moses Lake, where it is helping to raise 1952 crops. Water is tremendously important to the region; and a special thanksgiving service was held at Soap Lake on June 1, 1952, commemorating the arrival of the precious liquid.



Bureau of Reclamation Photo

Closeup of the pump platform and pumps used in the removal of chemicals from deposits in Soda Lake and Potholes East Canal, 3 miles southeast of O'Sullivan Dam.

An experimental 2-inch portland-cement concrete lining, designed to reduce canal-construction costs, is coming up for trial later in the 1952 season near Othello, Wash., and experimental asphalt-membrane linings are already in service. These, together with the simple but novel method of removing the injurious chemical deposit from Soda Lake, are the 1952 engineering highlights of the water-delivery work the Bureau is pushing this year.

Personnel

Operations at Soda Lake were under the direction of Charles F. Thomas, Construction Superintendent for the USBR, with L. V. Downs as Supervising Engineer and F. S. Arnold, Chief of the Construction Branch. L. N. McClellan, Chief Engineer for the USBR, was in over-all charge of the work.

U. S. Defense Bonds are security bonds. Their purchase provides for your personal security as well as the security of the country.

"SUPER TENOL

"LITHOLINE® Protects Better"

When it comes to grease, Mr. Bloomer says:

"LITHOLINE protects better under the most difficult operating conditions — bearing failure has been reduced to a minimum. And this one grease eliminates the inventory problem of specialized greases.

"Needless to say, we're highly pleased with the reduced maintenance costs and longer life of our equipment — through the use of LITHOLINE."

FOR YOUR TOUGH JOBS

This is Autocar's new DC-65-T 142-inch-wheelbase diesel tractor. A 159-inch-wheelbase model is also available.

Diesel Truck-Tractor

A new diesel-powered truck-tractor has been developed by The Autocar Co., Ardmore, Pa. The Model DC-65-T comes with an all-steel driver cab. It weighs 9,750 pounds and has a gross combination weight rating of 50,000 pounds.

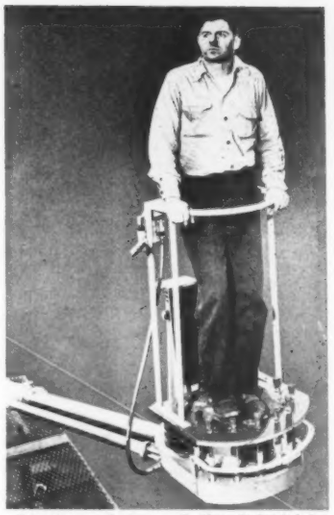
It is powered by a Cummins diesel with overhead valves. The cylinder block is cast integral with the crankcase and provided with removable cylinder liners. The engine develops 150 hp at 2,500 rpm.

The Model DC-65-T is produced in 142 and 159-inch wheelbase lengths. Standard tires are 10.00 x 20, but the wheels can take up to 11.00 x 22.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 649.

Syntron's Canadian Plant

Syntron, Ltd., Stoney Creek, Ontario, Canada, is a newly acquired subsidiary of Syntron Co., Homer City, Pa., manufacturer of vibratory material-handling equipment, portable power tools, diesel pile hammers, selenium rectifiers, and allied equipment. Production in the new plant is expected to start this month or next. It will eventually include Syntron's entire line.



Here's a closeup of the Industrial Monkey's self-leveling cage. Note the one-piece steel guardrail and the heavy-duty insulators under the platform that give the workman protection from more than 24,000 volts.

Self-Leveling Cage On Telescopic Boom

A hydraulically operated telescoping boom with a self-leveling cage has been developed to take a workman directly to the spot where he must do his work. It is made by The Donwill Co., 835 S. E. Main St., Portland 14, Oreg., and is called the Industrial Monkey.

The boom has a 270-degree turning radius, and a horizontal-to-vertical working span. The operator positions the cage at any desired spot through the use of six insulated foot controls, thus freeing both hands for work. The self-leveling cage is mounted on heavy-duty insulators and has a Micarta platform for protection against more than 24,000 volts. The workman is encircled by a waist-high, steel, one-piece guardrail. Besides the six foot switches that control the movement of the boom, he has a signal switch to the truck cab and an emergency stop switch for the truck. A duplicate set of controls is located in the truck cab for additional safety.

The boom and cage will carry a 200-pound man at any angle from the horizontal to the vertical position with a safety factor of more than 4 to 1. The boom can be lowered without oil pressure. The Monkey can be mounted on any 2-ton or heavier truck with 102 inches from rear of cab to center line of axle. The boom and cage retracts into a compact traveling position with a clearance of 10 feet 6 inches.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 627.

Safety Training Booklets

Plant safety men will be interested to know that the National Safety Council has made four additions to its series of job-training booklets. These pocket-size books are published for general distribution to industrial workers.

"Steps to Safety" provides a checklist of safety rules, stressing such topics as materials handling, fire prevention, machinery guards, etc. Information on protective clothing and equipment is provided in "It Pays to Dress Well". "Ship Shape" extolls the merits of good housekeeping, while "Down Time" points out that the worker's physical well-being is as important as his machine's.

These 16-page booklets, printed in color and illustrated with cartoons, may be purchased by Council members for 3 cents each in large quantities. Prices for nonmembers are double. A sample copy of the booklets will be sent free on request to the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

LENGTHENS ENGINE LIFE"

says JOHN F. BLOOMER CONSTRUCTION CO., Appleton, Wisc.

"Maintenance Costs Way Down"

The John F. Bloomer Construction Co. recently tackled a job that required the removal of one million yards of dirt. No tougher test could be devised to prove this statement by Mr. Bloomer:

"We've increased engine life considerably on our 26 pieces of heavy duty equipment since we switched to Sinclair SUPER TENOL. With this motor oil maintenance costs are way down. What's more, our equipment stays on the job longer with less time out for repairs."

Mr. Bloomer has this to say about Sinclair Diesel Fuel:

"Since changing to Sinclair Diesel Fuel, we've eliminated smoking conditions — and have noticed a marked reduction in carbon deposits on piston heads and valves. Our engines actually deliver more power with Sinclair fuel."

Let Sinclair help with *your* lubrication problems. Contact your nearest Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR SUPER TENOL®

Housing the bombed-out homeless was Italy's great concern after the war. But of equal concern were slums like this, breeders of despair—and of Communism.

Here, among the shacks on Via Gemite in Naples, rise new low-rental apartment buildings partly financed by European Recovery Program funds.

New Homes, New Hope, For Italians

Mutual Security Agency Photos

• AT the close of World War II, Italy faced a double-barreled housing problem. Not only did she need to replace 7,000,000 destroyed rooms—each often the abode of a whole family—but she had to reckon, in the process, with her slums; even in peacetime these had become a more or less permanent part of the landscape. It was a problem of housing the homeless, at the same time transplanting many who already had a roof over their heads—but a slum roof. Both the marks of war and the deeper marks of poverty had to be erased.

Housing projects like the one pictured here are helping to solve the problem. They, in turn, have been made possible by Marshall Plan money. Government housing alone has received $55 million in counterpart funds (lire covering the cost of U. S. goods, paid by the Italian purchaser but retained in Italy and applied to U. S.-approved rehabilitation projects). Another $16 million was apportioned to the European Recovery Program Home Development Fund in 1950. Large building schemes undertaken by the Workers Housing Fund were also partially financed by ECA. Thus, for example, dollars representing one-third of the total cost went into the 48-apartment Fuerigrotto Project in Naples.

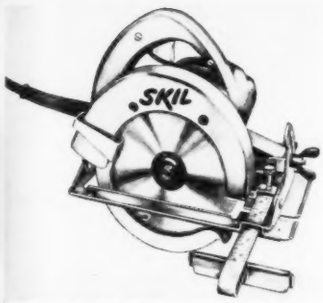
Many of Italy's people have been so long accustomed to life in shacks or caves that they cannot believe in the reality of these new apartment houses. In Sardinia they took no chances, but insisted on moving into their fresh quarters even before completion.

MINISTERO DEL LAVORO
PIANO INCREMENTO
OCCUPAZIONE OPERAIA
CASE PER LAVORATORI
ENTE APPALTANTE : COMUNE DI NAPOLI
CANTIERE N.192 PER LA COSTRUZIONE DI APPARTAMENTI
DAL N. 2705 AL N. 3225 VANI N. 125

The Marshall Plan shield reminds passers-by that these workers' homes of the Fuerigrotto Project in Naples, are being built with the help of counterpart funds.

Well spaced blocks of sunny apartments look onto green squares or clean roads lined with trees. Rentals are low for a couple and child, about 3,000 lire a month, or about 1/16 the average monthly salary of a clerk.

Over half the war-destroyed houses have now been replaced, but there's work for a decade more.



Depth of cut in the new 6-inch Skilsaw can be regulated from zero to 1 15/16 inches. The overall length is 10 inches.

Portable 6-Inch Saw

A heavy-duty 6-inch portable electric saw is offered by Skilsaw, Inc., 5033 Elston Ave., Chicago 30, Ill. Construction features of the Model 686 include a universal motor, ball and needle roller bearings throughout, aluminum-alloy housing, safety trigger switch, automatic blade guard with retracting handle, built-in bevel and depth-of-cut adjustments, and a precision-indexed rip guide for either right or left-hand use.

The depth of cut can be regulated from zero to $1\frac{15}{16}$ inches. Speed of the new saw is 6,000 rpm and it weighs $10\frac{1}{2}$ pounds. The overall length is 10 inches. Standard equipment includes a combination blade for general-purpose cutting, a wrench, a rip fence, a guard retracting handle, and 3-conductor rubber-covered cord.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 625.

Heater and Pumping Booster

A 4-page bulletin featuring the Deuce combination tank-car heater and pumping booster has been issued by Cleaver-Brooks Co., Milwaukee, Wisconsin. It explains how it is possible to raise penetration asphalts, tars, and other materials to the required high application temperatures, and deliver the material from the tank car to a distributor, transfer truck, or storage tank. The unit heats and transfers material through the direct oil-fired pumping booster.

Both the mobile trailer-mounted unit and the skid-mounted unit designed for truck mounting or stationary installations are illustrated. Features of the Deuce are listed, and the four-pass construction of both booster and heater units is illustrated by cutaway and sectional views. Included in the bulletin are complete unit specifications.

Also illustrated is the method by which the Cleaver-Brooks unit can steam-preheat one car to pumpable consistency, while circulating and heating a second car to application temperature. This same unit can then pump and load the distributor or transfer truck.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 621.

Caterpillar Elects Director

Robert Watt Miller, President of Pacific Lighting Corp., San Francisco, Calif., has been elected a director of Caterpillar Tractor Co., Peoria, Ill. He fills the vacancy created by the death of his father, C. O. G. Miller, last spring.

Vern Gillman and James Richards of the Utah State Highway Department take delivery of a Kelly-Creswell striper from Paul H. Creswell. It's the second large-capacity K-C striper built for Utah. The unit is equipped with special AGA-DeVilbiss striping guns for applying a two-color triple line, and has a capacity of 600 gallons.

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"Dodge beats any other trucks we ever owned!"

says J. R. BRYANT, J. R. Bryant Construction Co., Montgomery, Alabama.

"Last summer we put in a 13-mile stretch of mountain road where the trucks had to grind up steep grades in low gear. It was hot—and many of the trucks couldn't take it. But our Dodges never overheated and came through better than any of them.

"This job showed us that Dodge beats any other trucks we ever owned. Take the Dodge KA-140 with dump body, for example. It'll haul all the law allows and you can't hurt it. You can run it day-in and day-out with less overhead than any of them, and you can't find a cheaper truck to operate.

"Our drivers like Dodges better, too, because they handle like a car. They turn on a dime and this saves a lot of time on the job."

Mr. Bryant has proved by experience that Dodge *"Job-Rated"* trucks serve him better and save him more. *They'll do the same for* YOU!

For *your* job, there's a Dodge truck *"Job-Rated"* at the factory for top performance and lowest costs. You'll get big power with real economy. And you'll get famous Dodge dependability that means low upkeep and long life.

Ask your Dodge dealer about the rugged $2\frac{1}{2}$-ton model with 114-h.p. engine. Or the powerful $2\frac{3}{4}$-ton model with optional twin carburetion and exhaust system. Your friendly Dodge dealer will welcome an opportunity to co-operate with you on any hauling problem.

DODGE "Job-Rated" TRUCKS

Big Sewer Outfall For Highway Runoff

High-Strength RC Pipe, Up to 108 Inches in Diameter, Will Carry Drainage From New St. Louis Expressway

• SIDEWALK superintendents watching the placement of the new Carroll Street Sewer Outfall in St. Louis, Mo., were dwarfed by the Bunyan-size pipe sections required to handle high-capacity flows anticipated from the new Jefferson Memorial Expressway. Victory Construction Co. and Paul Krummel, both of St. Louis, held the $667,537 joint-venture contract. The project included excavation and placing of 3,683.37 feet of reinforced-concrete pipe from the intersection of Carroll Street and the expressway down to the edge of the Mississippi River.

The new expressway will reduce the heavy flow of traffic on Twelfth Street Boulevard, west of the central business district, by offering another route on the east side. Eventually it will become a part of U. S. 66 leading southwest out of the city. The Carroll Street Outfall will take care of the changed drainage conditions occasioned by the construction of the expressway—⅔ mile of which is depressed in this area. The outfall will also serve some overcharged city sewers.

All work on the project was under the direction of the Missouri State Highway Department. Its cost was borne by the Federal, state, and city governments—38.5, 38.5, and 23 per cent, respectively.

Sewer Design

Pipe sizes varied throughout the length of the job and many special sections were required to tie in with existing sewer mains. The largest pipe had a 108-inch inside diameter. Its 9-inch walls were specially reinforced according to a combination of ASTM requirements for single and double reinforcement. This pipe was used for 1,618 feet at the eastern, or outfall, end of the job. The remaining portion of the line was made up of 96, 78, and 72-inch ID pipe sections, and special tie-in sections.

The average invert grade ran from 0.35 to 1.37 per cent. One steep section ran on a 3.47 per cent grade and the last 250 feet at the river dropped on a 3.7 per cent grade. Cuts, almost all in earth, ranged up to 33 feet deep.

Construction

Two Link-Belt Speeder K-360 cranes handled virtually all of the operations. They worked separate sections, alternately digging the trench, driving or placing the sheeting, and placing the pipe. For the excavation they mounted Owen clamshells on their 55-foot booms. One had a 1½-yard clam, the other a 1¾-yard bucket. A Morin Tag-Master gave them careful control of the bucket while they were deepening the trench between braces and spotting the loads directly into the dump trucks. The contractors used Hug 6-yard rounded-body rock-dumps because they freed wet material easily.

On most of the work the contractors used 3 x 12-inch green-oak sheeting made up into 8 x 17-foot panels. These were cross-braced by 9 x 9's with a 2-inch Simplex screw jack on one end. The beams were about 10 feet on centers, the minimum span needed to lower the pipe in place. Where second-stage sheeting was required, the crane operator set the first-stage sheeting on a 4-inch shelf. The clay-soil shelf was fairly tight, and firm enough to support the panels after they had been tightly braced against the trench sides.

There were two sections where this procedure was varied. A 200-foot section near the river was sheeted with 30-foot lengths of interlocking sheet piles. A Vulcan No. 2 hammer, swung on the Link-Belt without leads, did the driving. A couple of Marlow pumps, a 1½-inch and a 3-inch, pulled seepage water out of the cut.

The other special section was where the sewer had to run under a series of 30 railroad tracks. Except for 5 or 6 main-line tracks the contractors were able to open up small cut sections right

C. & E. M. Photos

A Link-Belt Speeder K-360 places a section of 96-inch ID pipe for the Carroll Street Sewer Outfall.

The trench bracing was made up in panels and cross-braced with 9 x 9 timbers, 10 feet on centers.

SPEED UP YOUR

ACROW SHORES Set in Seconds

ACROWS are truly one-man shores. One man can set an ACROW Shore accurately in a matter of seconds by following three simple steps:

1) Lift inner tube to approximate height desired . . .

2) Insert steel pin in nearest hole . . .

3) Turn collar handle for final adjustment to the smallest fraction of an inch.

Stripping goes faster, too—just a twist of the collar handle and ACROWS are down . . . ready to telescope compactly for easy transport to the next job or for space-saving storage.

ACROWS give you 100% salvage—they can be used on all construction jobs with their complete range of four sizes. Use them over and over again—ACROW'S all-steel construction is practically indestructible.

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Birmingham • 7-5151
Los Angeles • Lomita 2889
San Francisco • ATwater 2-1441

The pipe is shown here in place, with load lines still attached. Engineers check the invert grade.

A dry grout backfill is placed around the pipe from a 1-yard concrete bucket handled by the Link-Belt Speeder.

across the yard. For each of the main-line tracks, they drove 30-foot-long sheeting at the outside edges of the prospective cut. Then they placed three 12 x 16-inch timber mud sills on each side of the proposed cut and supported the RR crossties on six 12 x 16 stringers. With the "bridging" in place, they were able to excavate under the tracks and place the pipe without interference to the train service.

Each pipe section was placed as soon as the cut was extended far enough to admit it. A 5-foot section of 108-inch-diameter pipe weighed 8½ tons. The heaviest were the 8-foot-long sections of 92-inch pipe. These weighed 12½ tons. The Link-Belt Speeders had no difficulty lifting and placing the pipe by means of eye bolts set at the center of the pipe sections. Lock Joint Pipe Co. supplied all pipe for the project. A Yale 3-ton chain fall—acting between a steel pipe and a timber post wedged into the previously placed pipe sections, and a timber crosspiece at the lip of the section going into place—brought the new sections tightly into the joint. Pipe joints were filled with a 1 to 1 troweled-on mortar.

Except in areas where rock or boulders were encountered, the pipe sections rest right on the subgrade and were backfilled with a Mississippi River sand supplied by Aggregates, Inc., St. Louis, Mo. In the rock areas, the contractors backfilled to the spring line with a 2 to 1 dry grout. The dry grout was batched on the site and dumped between the sheeting and the pipe by a 1-yard bottom-dump bucket.

When the last of the backfill was tamped in place the trench was covered with a compacted 8-inch crushed-stone base and 2 inches of asphaltic-concrete surfacing.

Personnel

The contractors employed about 41 men on the job, working a single shift. Doc Berry and Oliver Mahiger directed the working crews. The Missouri State Highway Department was represented by J. J. Krebs, Project Engineer. R. W. Hodson is Division Engineer for St. Louis; Rex M. Whitton is Chief Engineer of the Highway Department.

New Self-Powered Self-Propelled Drill

A self-propelled self-powered wagon drill that operates from an arm extending 6 feet to the rear of a Pneumatractor is announced by Schramm, Inc., West Chester, Pa.

The Deluxe Pneumafeed drills in a 180-degree arc at any angle. It can drill horizontally to a distance of 10 feet above ground level and 3 feet below ground level. When traveling, the unit fits in front of the rear wheel and close to the tractor body. It can be equipped with a paving breaker for cutting edges of ditches, removing curbs, and driving sheeting.

Further information may be secured from the company. Or use the Request Card on page 16. Circle No. 619.

Engine Test Kit

A new test kit for maintenance checks on General Motors diesel engines is announced by Kent-Moore Organization, Inc., General Motors Bldg., Detroit 2, Mich. The No. J-4209-41 has equipment for checking the timing, exhaust back-pressure, engine rpm, blower intake restriction, air box, oil crankcase pressure, and cylinder-liner position on all Series 71 and 6-110 engines. Compression gages and a fuel-pressure gage are also available for both series.

All testing equipment is mounted in a lightweight metal box, and includes zero to 15-pound and zero to 100-pound pressure gages, a magnehelic gage, a 300 to 3,600-rpm tachometer with flexible extension and adapters, a dial indicator with attachments, and a cylinder-liner gage block.

Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 617.

The J-4209-41 diagnosis kit for checking General Motors diesel engines. The box is metal.

RCONSTRUCTION with ACROW

ADJUSTABLE STEEL SHORES

ACROW Steel Shores are engineered and built from base to head for the fastest, safest, securest support on the job. Completely positive simple action leaves no chance for slippage. There is no cutting, wedging, or nailing to eat up time and money. And ACROW Shores have no jacks, levers, or supplementary tools to lose.

EXCLUSIVE ACROW SELF-CLEANING FEATURE makes possible rapid stripping operations. A unique patented extension of the collar nut extends over a segment of the threaded tube (see left). When collar handle is turned in stripping operation, encrusted concrete, dirt, and grit are removed from the thread—making ACROWS instantly ready for use on the next job.

GENERAL SPECIFICATIONS

Shore Sizes, Dimensions, Weights, and Capacities

Size No.	Height		Weight in lbs.	Failing Load		Recommended Safe Working Load	
	Fully Closed	Fully Extended		Fully Closed	Fully Extended	Fully Closed	Fully Extended
1	5 ft. 7 in.	9 ft. 10 in.	46	10.96 tons	8.97 tons	8210 lbs.	6720 lbs.
2	6 ft. 7 in.	10 ft. 10 in.	49	10.50 tons	7.90 tons	7840 lbs.	5975 lbs.
3	8 ft. 2½ in.	12 ft. 5½ in.	56	10.15 tons	7.55 tons	7490 lbs.	5600 lbs.
4	11 ft. 0 in.	15 ft. 0 in.	69	7.27 tons	2.89 tons	5225 lbs.	2050 lbs.

Standard 6" x 6" Beam Type 14" x 4" J Head 14" x 4"*
*J Head available as an insert or standard head.

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Erection Technique Saves Building Time

Running Long-Boom Crane Through Left-Out Strip of Slab Permits Work on Steel and Concrete at Same Time

By ALBERT C. SMITH,
Associate Editor

• A NOVEL erection technique shaved weeks off the Austin Co.'s construction schedule on a $3,000,000 industrial building in Elizabeth, N. J. One-story-and-basement structures of this type, with a concrete flat slab and a steel-truss roof, are usually built by first pouring the floor slab, then supporting it with shores, and finally running two cranes on top of it to erect the roof. But Austin tried another method this time in which one crane handled all the steel erection and all trades were kept busy while the floor was being poured.

A 40-foot center strip of slab was left out so that a big Lima 750 could set all the steel as it gradually backed out over the basement traprock fill. A P&H 255 crane fed steel members and trusses from a track siding to the building's edge. The long-boom Lima reached out from its slot, picked them up, and set them in place on either side of the building. This technique not only permitted work to proceed simultaneously on concrete and steel, but also allowed roofers, masons, and mechanical and electrical workmen to follow right behind the erection.

Long Boom

The big Lima used a 110-foot boom and 20-foot jib with which it could set steel 100 feet from the cab. One signalman at the working end relayed messages to a second signalman at the edge of the open ramp. Eighty-foot welded trusses for the center span, 60-foot trusses for the side spans, and all of the remaining 690 tons of steel were set in this manner. A temporary wooden trestle was used to carry concrete buggies across the gap; it was moved back as the crane moved back.

Excavation

Work on the 200 x 600-foot building began in October, 1951. The structure was laid out in the middle of an existing parking area after the cinders and car stops had been transferred to an adjacent site. United Excavating Co. then moved in with a 1½-yard Lorain and a 1½-yard Bay City shovel. Up to 20 dump trucks were used to move the 53,000 yards of basement excavation. About 90 per cent of this was trucked off the site and used as fill around the city of Elizabeth. The remaining 10 per cent was converted to mud by a rainy autumn and early winter; this was dumped in low spots on the site.

Forms for footings were used only in the wet spots. In dry areas, excavation was cut to the size of the footings. Eight-foot-square reinforced spread footings were used under the roof-supporting columns and 5-foot-square unreinforced spread footings under the intermediate slab-supporting columns. Six inches of traprock was placed over the entire basement subgrade for drainage.

The reinforced-concrete basement walls are about one foot wide and have a 4½-inch shelf on the exterior face to support the outside brick. This shelf eliminates a water table and helps to give the appearance of brick coming out of the ground. From the first floor up, the wall consists of 4 inches of exterior red brick and 8 inches of yellow interior Speedtile. Tile was cut with a Clipper Model E-50 tile saw. Tubular-type Universal masonry scaffolds were used on the exterior walls.

Typical 20-foot bays on round spirally reinforced columns comprise the flat-slab first floor. The slab is designed for a live load of 200 pounds per square foot. It consists of 8½ inches of reinforced concrete, with 3 x 4 sleepers and a cinder fill directly on the concrete; over this is 2 x 6 shiplap and then a maple floor. The sleepers were nailed to the concrete with special ¼-inch spikes fired from an explosive-type driver. Workmen reported they were

C. & E. M. Photo

A Lima 750, backing out over basement traprock, sets the last trusses on an industrial building in Elizabeth, N. J. Austin Co. was the contractor. The one crane set all the steel on the job.

Finger-tip gearshifting for heavy-duty

Allison TORQMATIC Transmission quick-shifts under load at full throttle—saves time—cuts operating and maintenance costs

PERFECT teammate for the famed Allison Torqmatic Converter is this Torqmatic Transmission — an exclusive development that takes the work out of gearshifting in even the largest off-highway trucks and heavy earth-moving vehicles.

Embodying the same basic design principles as the Allison Torqmatic Transmission, which has long been used in U. S. armored vehicles, this Allison quick-shift transmission eliminates "gearshift guess"—puts an end to laborious clutch pedal pumping and the usual manual gearshifting.

Unlike conventional sliding-gear types, the Allison hydraulically controlled *Torqmatic* is a constant-mesh, planetary-gear transmission. With a simple flick of a lever, the driver can shift from one range to another *at full load without taking his foot from the throttle*—and without losing momentum.

A Smooth Power Flow

Coupled with the cushioning effect and automatic features of the Allison Torqmatic Converter, this transmission greatly extends the torque converter's capacity. This means that trucks u... 50-ton pay load can climb steep gr... with the smoothness and operating ... you enjoy with an hydraulic trans... sion in your car. It cuts maintenanc... increases truck life. It reduces oper... fatigue. It enables drivers to ha... bigger pay loads on faster schedules... *gets more work done at lower cost ... ton-mile.*

driving spikes at a rate of more than one per minute. A surface protector was used on the base of Powder Power Tool Co.'s Drive-It 400 to minimize splintering the weed. A .38-caliber cartridge fired the 4-inch spike through the smooth bore into the wood and then the concrete.

The columns were poured with the slab and were formed by special steel-plate sections supplied by Pioneer Engineering Corp. of Jersey City. Oiled plywood forms, ¾ inch thick, were used on the walls and deck. Wall forms were held together by Richmond ties. Shores were generally 4 x 4's set on wedges and planks, and placed about 4 feet on center. Forms were used about 7 times.

All concrete was transit-mix and supplied by Loizeaux Co. from its plant a mile from the job. Generally, 10 CMC buggies operating on one-way traffic ramps poured all of the slab and column concrete. On part of the wall and also in inaccessible places a Blaw-Knox bottom-dump bucket was used with a P&H crane.

C. & E. M. Photo

A workman uses a Drive-It power tool to nail sleepers to the concrete at the rate of more than one per minute on the Austin Co. job.

Basement Floor

The 5-inch basement floor slab was poured in a checkerboard pattern on the compacted traprock. Concrete was chuted through basement windows to a 2-yard Jaeger portable hopper with two spouts. Jackson buggies picked up the concrete at the hopper and carried it to the bay being poured. The 2 x 8 side forms were keyed to provide load transfer at the joint.

After the concrete was placed, a 22-foot-long 4-inch steel pipe with handles was rolled along the top of the 2 x 8's as a screed. When the concrete had reached the proper point of set, Master Builders floor hardener was spread on the top and worked in by a Kelley compactor. The last mechanical surfacing was done with a rotating-type 3-paddle Whiteman finisher. Finishing touches were put on by hand.

Roof Trusses

The steel roof framework consists of one center truss 80 feet long and two outside trusses 60 feet long, giving only two column lines inside the building. The welded trusses were fabricated at the Austin Co.'s Bliss Mill and shipped directly to the site. Primary field connections were riveted; secondary connections were bolted.

C. & E. M. Photo

Here a Whiteman cement finisher does the final mechanical surfacing of the basement floor.

Typical of Austin's "controlled-conditions" design, the structure will house eight air-handling units, complete with fans, filters, and coils, for air-conditioning the entire building. The huge units were assembled at floor level on steel platforms and then raised up between the trusses with 4 chain blocks. Each 40 x 20-foot platform holding two air-handling units was raised and secured in about 2 hours. The load on each platform was 12 tons.

Precast-concrete roof slabs, generally 7 feet long, were placed side by side, clipped to the steel, and then pointed up with mastic. For insulation, about 140,000 square feet of 1½-inch Pittsburgh Foamglas blocks were set on the slabs. These blocks are 12 x 18 inches and were laid on hot tar. Lapped felt roofing paper on asphalt mix provides the top cover.

One of the new design features is the reinforcement against settlement provided at each corner of the building. Pencil rods set in horizontal masonry joints extend back to the column lines and terminate at vertical premolded control joints running the full height of the building.

The job is typical of Austin Co.'s system of design-construction, which it originated. All architectural, structural, mechanical, and electrical work was done by Austin engineers in the Roselle, N. J., office, only a few miles from the job.

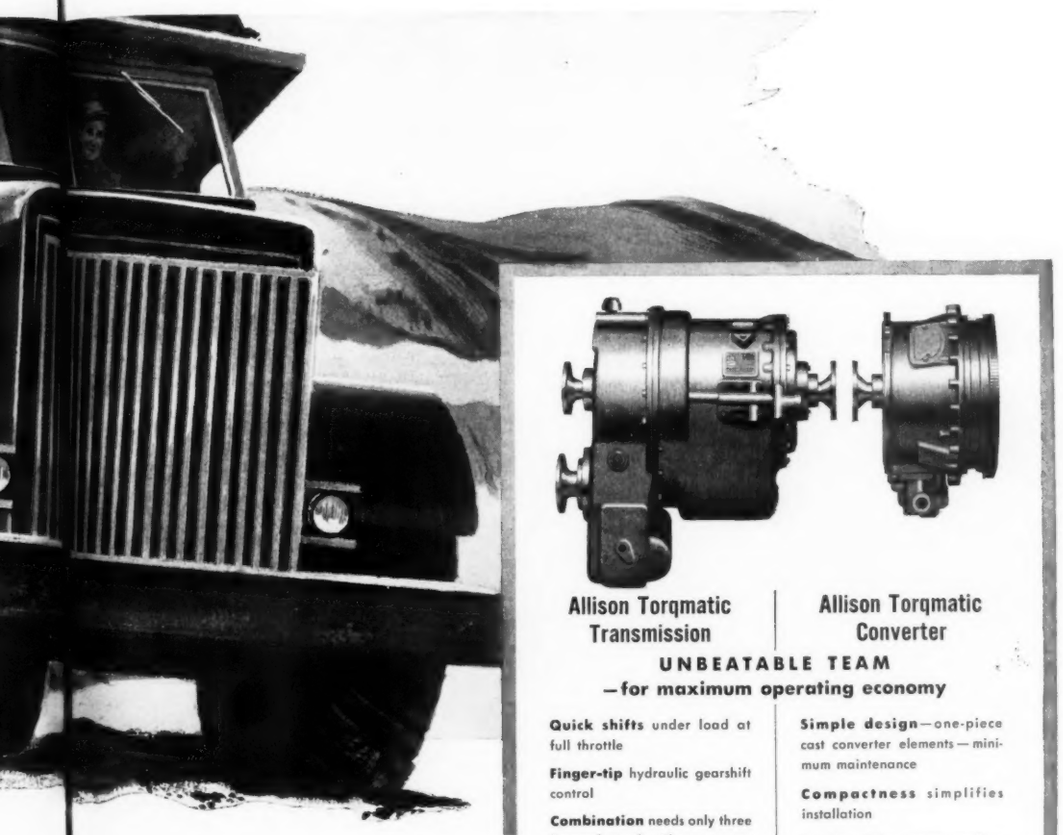
Representing Austin in the field were Walter Michaelson, Superintendent, and Edward Groux, Assistant Superintendent. F. H. Gummick, Plant Engineer, is the owner's representative. The maximum number of men on the job was 275 with a field staff of 9.

Ohio Turnpike Financed: Contract Bids This Month

The 241-mile Ohio Turnpike received official sanction last July when an investment-banking syndicate handed over $319,882,972—the proceeds of private financing—to the Ohio Turnpike Commission. The Commission, in return, issued $326,000,000 of serial bonds, which means that for each $1,000 bond issued, it received $976 from the investors.

Construction will get under way before November 1 and plans call for the job to be finished within 34 months. It is stipulated that the first section—a 25-mile stretch adjacent to the Pennsylvania Turnpike—must be completed by the end of 1953. Advertisements for the first contract will appear between September 15 and October 1.

The Ohio Turnpike is the second link in the proposed superhighway that will stretch across nearly a quarter of the country from the Pennsylvania Turnpike near Philadelphia to Gary at the southern end of Lake Michigan in Indiana.



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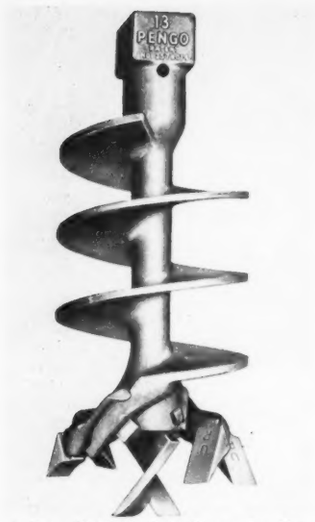

A three-flight single helix carries dirt out of the holes bored by the new Pengo anchor auger.

New Anchor Augers

Three new augers which bore holes for expanding anchors are manufactured by Petersen Engineering Co., 460 Kifer Road, Santa Clara, Calif. They retain the identical cutting features of the Pengo earth auger except that a three-flight single helix instead of valves is used to carry dirt out of the hole. This is said to permit completion of the hole with less than half as many trips up and down, and to clean the bottom of the hole better. The size of the center shaft is reduced, which makes it possible to bring rocks out of the hole. The auger may be used in all types of soil, including hardpan, sandstone, frozen ground, and permafrost.

Cutting heads of the anchor augers are equipped with the same fishtail pilot bit and replaceable teeth used on all Pengo augers for rapid penetration and fast drilling. Shank plates, bolts, etc., are also interchangeable with other Pengo augers, so that users need maintain only a minimum stock of replacement parts.

The anchor augers come in three sizes: a 9-inch for 8-inch expanding anchors, an 11-inch for 10-inch anchors, and a 13-inch for 12-inch anchors. They are available with different hubs to fit all makes of earth-boring machines.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 610.

The Story of Southern Pine

Men who work with wood will want to read "The Southern Pine Story", a new booklet published by Southern Pine Association, P. O. Box 1170, New Orleans, La. With colorful text and illustrations, the booklet begins with the southern pine tree, explaining what it is, where it grows, and what its characteristics are.

Following this is a history that goes back to the time when Captain John Smith made his first report to the Virginia Company in 1608. He indicated that "the countrey is most over growne with pynes." Other chapters of the booklet tell of the wide range of uses of southern-pine lumber, describe its processing, and tell how it is grown as a crop.

This literature may be obtained from the association, or by using the Request Card at page 16. Circle No. 634.

Luria Engineering Promotes

Bert L. Snell, former Project Manager, has been promoted to Assistant General Sales Manager of Luria Engineering Co., New York, N. Y., designer, fabricator, and constructor of standardized steel industrial buildings and airplane hangars. In his former post he was in charge of large-scale operations at the Fairchild Air Force Base, Spokane, Wash., and at the Air Force Base in Rapid City, S. Dak. Mr. Snell will make his headquarters at the company's fabricating plant located in Bethlehem, Pa. Luria Engineering is a division of the Luria Steel & Trading Corp.

No Packing! No Stalling!

Rotary drill masonry with carbide tipped Cyclo-Core or Cyclo-twist

Multiple spiral flutes, which run the full length of the shell, positively remove dust as it is pulverized. Removable Cyclo-Center for locating and starting holes. Recommended for hole sizes ¾" to 6" diameter in hard concrete, using electric rotary drill. Extra shank lengths available—all diameters.

Twin spiral flutes remove dust speedily and surely. Carbide tip same diameter as body, no carbide hang-over—maximum strength. Recommended for hole sizes 3/16" to 1½" in soft or medium masonry material, using an electric rotary drill, drill press or hand brace. Extra lengths to 36".

By the makers of Thunder-twist and Thunder-Core Hammer Bits. *Send for new Masonry Drill Bit Guide—Helps you choose the RIGHT bit for EACH job!*

New England Carbide TOOL CO., INC.
60 BROOKLINE STREET, CAMBRIDGE 39, MASS.

Scottie "Construction Expert" McBlock approves a combination of superior features.

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CONSTRUCTION BLOCKS

Are approved by construction men who specify these superior features.

- ★ **All steel construction throughout.**
- ★ **Bronze bushings or HY-LOAD roller bearings, for medium or high speeds.**
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- ★ **GUARANTEED to carry rated loads for the life of the block.**

Catalog on Request

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Box 2496 Tulsa, Oklahoma

...You can cut Equipment Repair Time as much as 40% with

HYPRESSURE Jenny STEAM CLEANER

Time studies show that repairmen, working on dirty machinery, spend up to 40% of their time wiping mud, muck and grease from tools and equipment. JENNY steam cleaning, *before* repairs or reconditioning, saves those lost man-hours; cuts equipment repair time—and expense—practically in half; gets your equipment back into service—and earning—nearly twice as fast.

JENNY steam cleaning is 10 times faster than hand-cleaning methods. One man using Hypressure JENNY, can do more cleaning in an hour than 10 men can accomplish in the same time by solvent-brush-and-scraper methods.

JENNY cuts time and labor costs 90% on jobs such as cleaning brick, tile, stonework, concrete, building exteriors and preparing bridge and structural work for painting.

Hypressure JENNY is sturdy, portable, safe, economical. Ordinary labor can operate it.

Send for free illustrated booklet, "1001 Ways to Extra Profits with Hypressure Jenny." No obligation.

HYPRESSURE JENNY DIVISION
Homestead Valve Manufacturing Co.
P. O. BOX 30 *"Serving Since 1892"* CORAOPOLIS, PA.

The power drive on the Model 252 Di-Met concrete cutter is said to double the life of the diamond wheel by removing human variation in feeding.

A Concrete Cutter Has New Power Drive

A concrete-cutting machine which features a new power drive has been announced by Felker Mfg. Co., Torrance, Calif. A 13½-hp Wisconsin air-cooled engine drives the diamond blade and furnishes power to the rear wheels through a stepless variable-speed reducer and friction drive. Speed may be adjusted by rotating a crank. According to the company, the power drive, when tested, has doubled the life of the diamond wheels by removing human variations in feeding.

A built-in double-acting hydraulic jack raises or lowers the diamond wheel. It also expedites coupling the machine to a trailer hitch for towing, since the front wheels automatically retract as the valve is released. Depth of cut is established by an adjustable stop. Front and rear guides are provided.

The Model 252 Di-Met uses diamond wheels on either end of the 1¾-inch spindle in diameters from 10 through 18 inches. Wheel guards of 14 and 18 inches are interchangeable for right or left-hand use. They hinge at the top center, the front half lifting to expose the blade for close-up operations such as curb cutting. The diamond wheels are equipped with special slotted collars which centrifugally eject coolant around the complete wheel rim, thus flushing kerf and wheel constantly. A pressure connection is provided for an external water source. If the unit is gravity-fed from a tank, a built-in pump pressurizes the water.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 609.

Self-Propelled Roller

A ½-ton self-propelled roller for maintenance and landscape work is made by Cleveland Formgrader Co., Mills Road, Avon, Ohio. The Poweroll comes in two weights: 10-gage for landscape or 3/16-inch plate for paving work. Powered by a 1½ or 3-hp air-cooled engine, the unit weighs 460 pounds empty and 1,000 pounds filled with water. The drum has a 24-inch diameter and is 35 inches wide.

Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 559.

The Poweroll self-propelled roller comes in two weights — 10-gage or 3/16-inch plate. It weighs 1,000 pounds water-filled.

Warner Gear Div. Promotes

E. Swain Russey has been elected President of the Warner Gear Division of Borg-Warner Corp., Chicago, Ill., manufacturer of automotive parts. He succeeds A. P. Emmert, who retired from active management of the Division after 25 years of service. Mr. Emmert will continue as Vice President of Borg-Warner. Mr. Russey, who has been Vice President and General Manager of the Division since 1944, has served in practically every departmental activity in the organization.

Four new vice presidents were appointed: T. J. Ault, William H. Cortwright, John C. Oesterle, and Andrew W. Rose. Each of these departmental executives has been with the Division 20 years or more.

The following officers of the Warner Gear Supervisory Board were elected to serve during the ensuing year: C. S. Davis, Chairman; A. P. Emmert, Vice Chairman; and J. C. Oesterle, Secretary.

ROAD BUILDERS—IT'S SENSATIONAL

STEEL WIRE BIG PECKERWOOD DRAG BROOMS

IT'S FRAMELESS TRADE MARK REG. NO FRAME REQUIRED

6 INCHES WIDE AND ANY LENGTH TO 12 FEET
NAME YOUR LENGTH — ASSEMBLE YOUR OWN
IN ANY SHAPE WANTED — IN MINUTES — NOT HOURS

MADE WITH KILN DRIED 6" WIDE HARDWOOD AND HEAVY GAUGE SPRING STEEL WIRES. TRIPLE WIRES OUT EACH HOLE.

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ILLUSTRATION OF 12-FOOT SECTION

ONLY $3.50 RUNNING FOOT

THE TOUGHEST WIRE DRAG BROOMS EVER BUILT

LITTLE PECKERWOOD
STANDARD UNIT SIZE
MADE TO FIT YOUR FRAME
3" Wide, 15" Length
with 2 Bolts.
Double Wires
Out Each Hole

OUR DRAGS NOT STAPLE SET. BOTH STOCK ITEMS.

NOW $2.50 EA.
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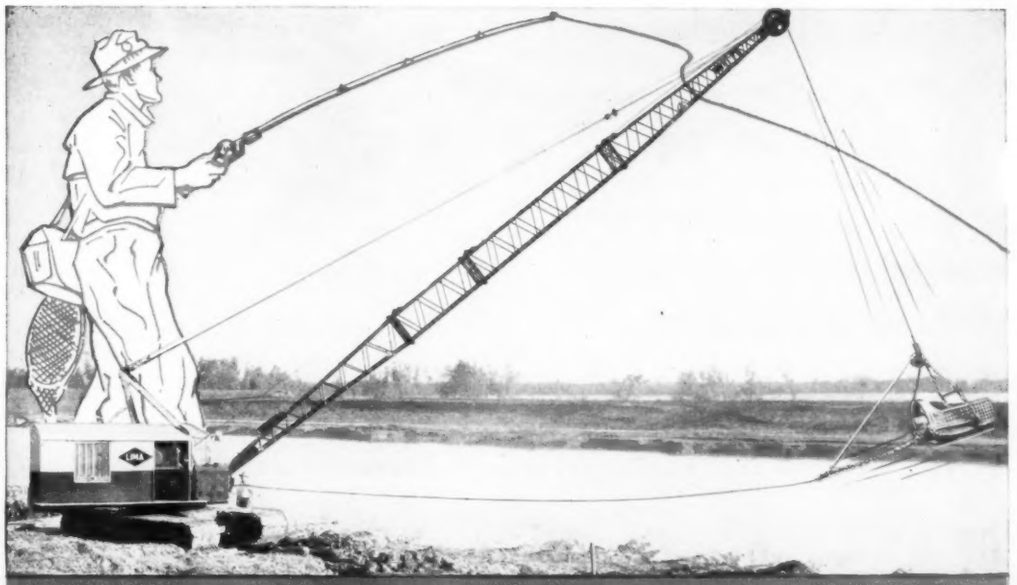

LIMA DRAGLINES use
The Fisherman's Secret
FOR A GOOD CATCH

When you're fishing, and want to drop the bait in the far pool where the big ones are waiting, your reel's got to be *friction-free* to let that line flow out, smooth as cream from a jug. And, after the strike, come in the same way.

When you're after record yardage, a smooth flowing line is just as vital . . . so we took a tip from the fisherman, and made our reels friction-free. You can 'cast' the dragline bucket further, increase your radius of efficient operation from each location. You can bring in bigger catches, because more power is going into the work lines and less into *friction drag on the machinery*. And there's further big benefits from reduced maintenance . . . less frequent lubrication, and smoother operation, because misalignment from bearing wear, that affects clutch alignment and functioning, is eliminated.

Lima pioneered the use of anti-friction bearings at all important bearing points on draglines, shovels, and cranes. They've kept on pioneering with other improvements that put Lima equipment in the top rank of profitable performers. If you want proof of this—just ask the Lima user. If you want details on how to put Lima equipment on your *pay-off* roll . . . just get in touch with us.

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Material Spreader Controlled from Cab

A truck-mounted material spreader with capacities from 7⅓ to 12⅓ cubic yards is announced by Highway Equipment Co., Inc., 616 D Ave., N.W., Cedar Rapids, Iowa. The feed gate of the Model W Spread-All can be controlled by the driver from the cab.

The unit will spread from 4 to 70 feet wide at speeds from 2 to 25 mph. It can distribute material to the right, to the left, behind or ahead or all 4 directions at the same time.

The rock salt, sand, aggregate, calcium chloride, or cinders inside the steel body falls down along the 30-degree sloping sides to the 24-inch roller-type conveyor. The conveyor feeds the material to 20-inch abrasion-resistant disc where 6 removable fins spread to any desired width. The disc is enclosed with 5 independently adjustable baffle plates. Removable and adjustable shields protect the chain links from the material being spread.

The Model W Spread-All operates from an auxiliary engine or from a power take-off.

The Spread-All can be powered from the truck, a power take-off, a 13-hp Wisconsin engine or independent hydraulic motors. The conveyor and distributor disc can have mechanical, vacuum, air, or hydraulic control.

Optional equipment includes an 18-inch-wide 3-ply rubber-covered belt riveted over the flights. It is used to reduce corrosion of the chain. A sealer belt between the chain shield and conveyor belt prevents sifting of material onto the links.

Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 648.

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Builders told us what they wanted...

BERGER engineering did the rest...

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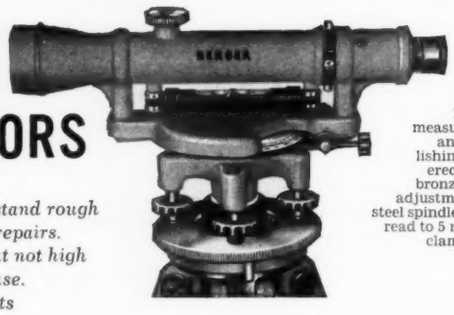
BRASS and BRONZE CONSTRUCTION

Precision-Engineered Berger "N" Line

Convertible Transit-Level
For laying out and measuring horizontal and vertical angles, leveling, measuring differences in elevation, setting building lines, plumbing walls and columns. 12" erecting-internal focusing, hard bronze telescope; rack and pinion adjustment; 22 power coated optics; steel spindle. Verniers read to 5 min. Dust protected leveling, clamp and tangent screws.
Code name COTRA.

NEW MODERATE-PRICED INSTRUMENT LINE for BUILDERS and CONTRACTORS



Heavy Duty 12" Dumpy Level
For setting grades and lines, measuring or laying off horizontal angles, running profiles, establishing foundation elevations. 12" erecting-internal focusing, hard bronze telescope; rack and pinion adjustment; 22 power coated optics; steel spindle; horizontal circle. Verniers read to 5 min. Dust protected leveling, clamp and tangent screws.
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They wanted instruments that would stand rough usage—without being down for costly repairs.

Accurate performance, of course, but not high cost... simple construction, handy-to-use.

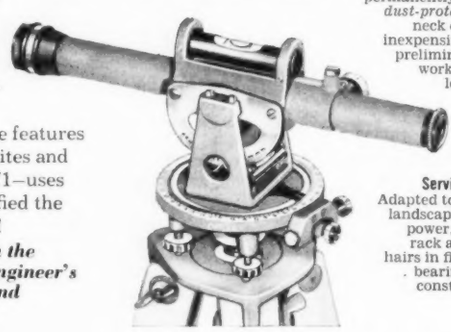
ABOVE ALL... *they wanted instruments priced to fit their budget.*

Berger put its 80 years of precision engineering knowledge to work—field-tested each improvement—checked reactions of contractors, builders, engineers for several years—produced the Berger "N" line of builder's instruments, of brass and bronze construction, precision-engineered but moderate in price.

The "N" line* incorporates many of the features for which Berger transits, levels, theodolites and alidades are famous—have been since 1871—uses the same materials. We've merely simplified the design to build this moderate-priced line!

You may have descriptive literature on the instruments illustrated and all Berger Engineer's Transits, Levels, Alidades, Theodolites and Astronomical Instruments. Write today.

Berger Hand Level
New, exclusive development. All parts *permanently* fitted...cannot go out of adjustment. Stabilized internal focusing. Interior permanently mounted level vial. *Fully dust-protected.* 6½" long. Attached neck cord. Modern, convenient, inexpensive leveling instrument for preliminary surveys, construction work, road building. Top grain leather case with belt loop.
Code name MANLE.



Service Transit-Level (Farm Level)
Adapted to needs of builder, farmer, landscape gardener, carpenter. 10-power, 10½" erecting telescope; rack and pinion focusing. Cross hairs in fixed focus. Dust-protected bearings. Tripod legs of 1-piece construction with metal shoes.
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Complete instruction manual with each instrument.

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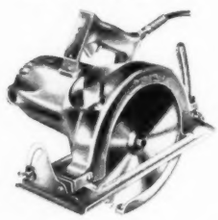
BRADFORD ELECTRIC SAWS

Model 160 — 6" Saw
Vertical depth of cut 2"
Bevel cut at 45°: 1¼"
Net weight 10 lbs. 8 oz.



Model 180 — 8" Saw
Vertical depth of cut 2 29/32"
Bevel cut at 45°: 2 1/16"
Net weight 17 lbs. 8 oz.

These new 6" and 8" Bradford Portable Electric Saws are ruggedly constructed and fully powered to take on the *toughest* sawing jobs! They're better designed—inside and out—for easier handling, smoother sawing, more accurate work. You can *feel* the difference in the Bradford design!

And Bradford Saws are built to last. Ball bearings with permanent lubrication are used throughout. Gears are helical cut to give maximum driving power. A powerful 110-volt AC/DC motor drives the blade with quiet, cool-running efficiency.

Own a new Bradford Portable Electric Saw — they're the choice of craftsmen everywhere. See your Bradford dealer for a demonstration. Write for bulletins giving specifications and prices.

THE BRADFORD MACHINE TOOL CO.

653 Evans Street Cincinnati, Ohio

Precision since 1840

TAL Hydraulic Portable Pipe and Conduit Benders: ⅜" to 4"

Save pipe fittings and conduit elbows

Bend Pipe Cold

Make Perfect Bends.

Other Equipment:
Tube Benders 1" to 3"
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BAND-IT PRESSURE HOSE CLAMPS
BAND-IT PREFORMED CLAMPS

AMERACO Dept. B, 1047 E. 76th St. Chicago 19, Illinois

Airport Access Road Gets Tar Hot-Mix Top

Traprock Aggregate for Two-Course Bituminous-Concrete Pavement, 24 Feet Wide, Laid on Crushed-Gravel Base

• WHEN the new North Central State Airport at Smithfield, R. I., was completed last November, a modern access road was also in readiness to serve the field. This road, 1.46 miles long, was built for the Rhode Island Department of Public Works, Division of Roads and Bridges, by the Fanning & Doorley Construction Co., Inc., Providence, R. I., under a $132,000 contract. Construction got under way the middle of March, 1951, and the road was completed in October.

Formerly only a narrow dirt track cutting across the fields, and called Albion Road at one end and Jenks Hill Road at the other, the new route connects the airport directly with George Washington Highway just west of its intersection with Louisquisset Pike. The Smithfield airport is about 7 miles from Providence.

The 24-foot bituminous-concrete pavement is crowned from the center at the rate of ¼ inch to the foot, and is flanked on each side by 6-foot shoulders. The two courses of plant-mix, made up of crushed stone and tar, were laid on a 6-inch crushed-gravel base course. Gravel was also used in the construction of the shoulders, which were given a penetration and bituminous seal.

Grading

The 22,090 cubic yards of excavation for the new road balanced out equally between the cuts and fills. A foundation course of gravel was then placed over the roadbed, varying in depth from 12 to 36 inches according to soil conditions. This material, of which 50 per cent was retained on the ¼-inch sieve, was obtained from a pit at one end of the job.

Over this foundation went a 6-inch crushed-gravel base, the material being graded from 3-inch down, and from 0 to 10 per cent passing the ⅜-inch sieve. Base gravel came from the Town Line Sand & Gravel Co. at Burrillville, R. I., a 10-mile haul from the job. Equipment used in the grading and gravel work included two Thew-Lorain 1-yard and ¾-yard shovels, two Caterpillar tractor-dozers, and two Adams motor graders. A fleet of 11 trucks did the hauling, and the lifts were compacted by 10-ton 3-wheel rollers.

The crushed-gravel base was choked with quarry screenings, obtained from Fanning & Doorley's trap rock quarry at Berkeley, and swept in by hand

(*Conclusion on next page*)

C. & E. M. Photo

Rear view of a Ford truck dumping hot-mix into an Adnun Black Top Paver for an access road at the Smithfield, R. I., airport. The contractor was Fanning & Doorley Construction Co., Inc., Providence.

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New Fourth Edition
by Philip Kissam
Exceptionally clear presentation of theory and practice, now completely up-to-date.
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Write for copies on 10-day approval
JOHN WILEY & SONS, INC.
440 Fourth Avenue, New York 16, N. Y.

NEW Cedarapids Built by IOWA Schrock Motorized HEAD PULLEYS

SIMPLIFY EVERY BELT CONVEYOR AND BELT-BUCKET ELEVATOR INSTALLATION

IT'S COMPLETELY DIFFERENT FROM CONVENTIONAL CONVEYOR DRIVES

Everything is contained INSIDE the pulley!

ELIMINATES ALL MAINTENANCE ON SPROCKETS, CHAINS, JACK-SHAFTS, V-BELTS, ETC.

U.S. Pat. No. 3548399 Others Pending

WHAT A *Motorized* HEAD PULLEY IS

THIS is a revolutionary departure from the conventional types of conveyor drives. A *motorized* head pulley is a fabricated steel pulley with *everything*... electric motor, reduction gears and all moving parts . . . contained inside the drum! It's simply a new application of the long-proven gear reduction drive, and because of its simplicity, it's the answer to the maintenance man's prayer. 70% to 90% of conveyor down time is saved by eliminating all countershafts, speed reducers, sprockets, chains, Universal shaft drive and other parts necessary with conventional pulley drives. Motorized Head Pulleys are simple to install and flexible in use, completely interchangeable and adaptable to all types of belt and belt-bucket conveyor installations. By means of a simple adapter, a single pulley can be utilized in any of several belt locations, operating various widths of belt, or changing from larger or smaller horsepower. Pulley sizes range from 5 to 30 HP and are available in various widths. A Motorized Head Pulley is safe, because there are no sprockets, chains, jack-shafts, V-belts, etc. to endanger personnel. It's compact... requires no more room than a conventional pulley. Complete protection from weather, grit and dirt also reduces maintenance. Cedarapids Schrock Motorized Head Pulleys have been job-tested for many years under severest working conditions.

HOW IT WORKS

The pulley shell rotates about the electric motor, which is held stationary by means of a torque arm attached to the conveyor frame. The speed of the shell depends upon the combined reduction ratio of the various pinions and gears contained within the pulley shell. This reduction starts with a primary pinion mounted on the motor shaft and ends in the ring gear attached to the shell. The shell in turn then drives the conveyor belt. Leads to the motor enter the head pulley through a hollow conduit passing through the drum end bell and bearing. A simple oil bath gear compartment provides a lubricating bath for the reduction gears and front motor bearing. Motor and head pulley are cooled and ventilated by holes in the drum.

GET COMPLETE DETAILS TODAY

Find out all the advantages of converting your conveyor installations to motorized efficiency before you need head pulley replacements. One internationally known company has 50 Motorized Head Pulleys installed on widespread conveyor operations, and plans more for every installation that requires replacement. Get complete details about every feature. See your distributor today, or write direct to Iowa Manufacturing Company.

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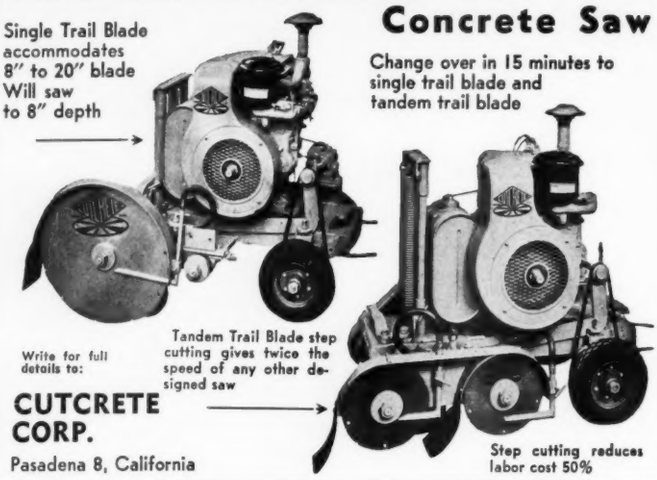
CUTCRETE MODEL STT Concrete Saw

Single Trail Blade accommodates 8" to 20" blade Will saw to 8" depth

Change over in 15 minutes to single trail blade and tandem trail blade



Tandem Trail Blade step cutting gives twice the speed of any other designed saw

Step cutting reduces labor cost 50%

Write for full details to:

CUTCRETE CORP.

Pasadena 8, California

C. & E. M. Photo

A Galion 12-ton tandem and a Buffalo-Springfield 4½-ton tandem compact the hot-mix.

Airport Access Road

(*Continued from preceding page*)

brooms. The base was rolled and more screenings were swept in until the interstices were completely filled and the materials were knit tightly together. Then the base was primed with RT-2 tar applied at the rate of 0.25 gallon to the square yard at a temperature between 125 and 130 degrees F. Bitumen was both supplied and applied by the Tar Products Division of Koppers Co., Inc., at East Providence.

Paving

Bituminous concrete, Class I, Type I-3, was next laid on top of the gravel base. On this job the bituminous concrete consisted of Tarmac RT-12, a tar plant-mix, with the tar supplied by Koppers and the aggregate coming from the traprock quarry of Fanning & Doorley. The commercial crusher at the quarry adjoins the Warren Bros. 2-ton pugmill plant of the Sealdrok Paving Co., which turned out the hot-mix.

Job formulas were:

Binder

Stone, 1¼-⅝-inch	23.60 per cent
Stone, ⅝-⅛-inch	35.25 per cent
Stone, ⅛-No. 10	17.55 per cent
Sand	19.00 per cent
RT-12 tar	4.60 per cent
	100.00 per cent

Top

Stone, ⅝-⅛-inch	10.00 per cent
Stone, ⅛-No. 10	39.75 per cent
Sand	43.35 per cent
RT-12 tar	6.90 per cent
	100.00 per cent

A fleet of six trucks, three owned by Sealdrok and three hired, delivered the material to the job after a 5-mile haul. Of the six vehicles, two carried 10 tons, one held 8 tons, and the other three took 6-ton loads. Plant-mix was laid by an Adnun Black Top Paver, and compacted by a pair of tandem rollers—a Galion 12-ton and a Buffalo-Springfield 4½-ton. The smaller unit was especially useful in compacting the material around the curbing at intersections, and in making the first pass over the center-line joint between lanes.

Pavement has a total thickness of 2¾ inches, made up of a 1½-inch binder and a 1¼-inch top. The binder was laid first over the entire job and was completed in four 8-hour days. Because of the extra care taken with the top or surface course to achieve exact grade, the upper lift was put down in five days. Total area of the pavement was 19,775 square yards.

After the plant-mix was completed, the shoulders were primed with T-3 tar applied at the rate of 0.75 gallon to the square yard. This was followed with a seal coat consisting of 0.25 gallon to the square yard of MC-3 asphalt and a light cover of sand put on by hand.

Personnel

An average force of 30 was employed on the access-road construction by both contractors. Charles Ricci was Superintendent for Fanning & Doorley Construction Co., Inc., while Fred Correia was Superintendent for Sealdrok.

For the Rhode Island Department of Public Works, Division of Roads and Bridges, Ronald Boyden was Resident Engineer, assisted by Michael Donelan, Inspector. The Department is headed by Philip S. Mancini, Director. George H. Henderson is Principal Highway Engineer, and Lee V. Spencer is Road Construction Engineer.

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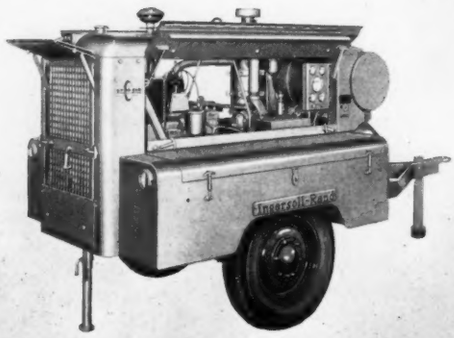
Ingersoll-Rand *Rotary* Mobil-Air

in capacities from 105 to 600 cfm



On any portable compressor job, the revolutionary GYRO-FLO can make important savings in the cost of *air power*. Because there are now four sizes of smaller, lighter, more efficient GYRO-FLO rotary compressors, one of them should be just right for your job.

No other portable compressor offers you all of these weight and cost saving advantages:

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- Delivers oil-free air at temperatures under 200°F.
- "Air-Glide" capacity control holds pressure constant within 10 psi range at any capacity, and with minimum engine speed.
- Matched to nationally known diesel or gasoline engines.

Your nearest I-R representative will be glad to give you the complete GYRO-FLO story.

GYRO-FLO 105	Capacity, 105 cfm at 100 psi. Total weight, 2630 lbs. GM 2-51 diesel or Continental F-162 gasoline engine.
GYRO-FLO 210	Capacity, 210 cfm at 100 psi. Total weight, 4630 lbs. GM 4-51 diesel or Continental M-330 gasoline engine.
GYRO-FLO 315	Capacity, 315 cfm at 100 psi. Total weight, 5200 lbs. GM 3-71 diesel or Continental B-427 gasoline engine.
GYRO-FLO 600	Capacity, 600 cfm at 100 psi. Total weight, 9500 lbs. GM 6-71 diesel engine.

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NW Engineers' Centennial

The presentation of a gold medal to ex-President Herbert Hoover for his contribution to engineering and the humanities was an important part of the celebrations at the Northwest Engineering Centennial in Portland, Oreg., last month.

The Professional Engineers of Oregon, whose President is W. C. Williams, played host to thousands of engineers from the three northwestern states. Included among the speakers at the three sessions of the all-day meeting were: Stanley A. Easton, President of Bunker Hill & Sullivan Mining Co., Kellog, Idaho; Dr. Tully C. Knoles, Chancellor of College of Pacific; Colonel T. H. Lipscomb, U. S. Army Corps of Engineers, Portland; Wilfred E. Johnson, General Manager, Nucleonics Divn., G. E. Co., Hanford Works, Richland, Washington, and John D. Coleman, President, National Society of Professional Engineers, Portland. The theme of the conference was, "What are the engineering profession's civic and public responsibilities?" and speakers reviewed past and future engineering progress in the northwest.

Work Accidents Take Toll

Work accidents reached such staggering heights last year that if a man worked 5 days a week for the next million years, he could not make up for the 280,000,000 days of lost labor. Here is only one aspect of economic loss from accidents that is covered in "Accident Facts", the National Safety Council's statistical annual. In terms of money, the accidents in 1951 cost the nation over $2½ billion.

One section of the book is devoted to occupational accidents and includes the most common sources of injury. In addition to this section, detailed statistical information is provided on all types of accidents—motor vehicle, home, school, etc. In all, the book provides the factual background for a safety program.

Single copies of the book may be obtained from the National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill., at 75 cents each. Prices are reduced for quantities.

Data on Line of Equipment

A new catalog on its entire line of equipment has been released by Syntron Co., 227 Lexington Ave., Homer City, Pa. It describes and illustrates the main features of the company's vibrators, feeders, drills, saws, and diesel pile hammers. Complete specifications for each product are listed.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 603.

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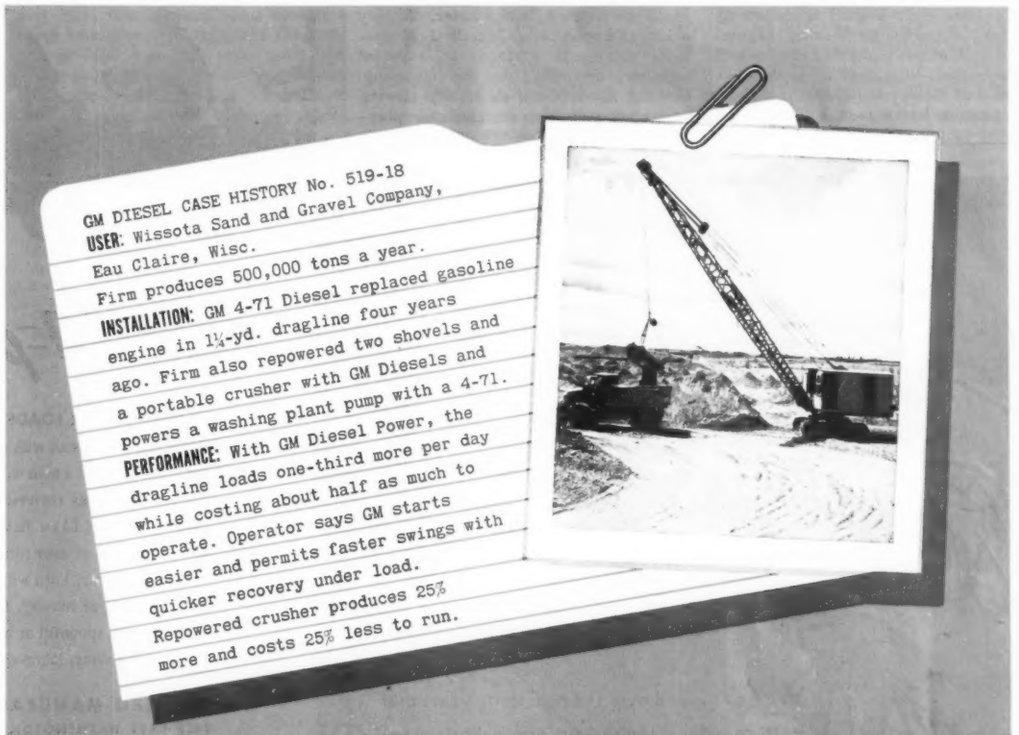
GM DIESEL CASE HISTORY No. 519-18
USER: Wissota Sand and Gravel Company, Eau Claire, Wisc.
Firm produces 500,000 tons a year.
INSTALLATION: GM 4-71 Diesel replaced gasoline engine in 1¼-yd. dragline four years ago. Firm also repowered two shovels and a portable crusher with GM Diesels and powers a washing plant pump with a 4-71.
PERFORMANCE: With GM Diesel Power, the dragline loads one-third more per day while costing about half as much to operate. Operator says GM starts easier and permits faster swings with quicker recovery under load.
Repowered crusher produces 25% more and costs 25% less to run.

This Diesel Loads 33% More Gravel

at one-half the fuel cost

You are money ahead when your equipment does extra work each day. But profits really mount when you save on fuel and maintenance at the same time. The General Motors Diesel engine gets more work done in less time because of its faster, more responsive 2-cycle operation—power at every piston downstroke. This quick-starting, smooth-running Diesel fits in about the same space as industrial gasoline engines of comparable power—and provides fuel and maintenance savings of 40% to 70%. Ask your GM Diesel distributor to show you the savings this Diesel can make in your equipment.

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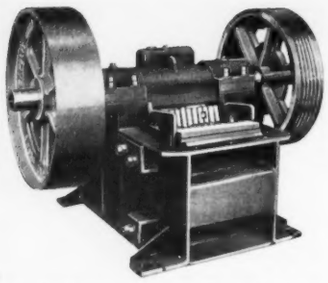

Production capacity of Pioneer's new 10 x 16-inch jaw crusher ranges from 4 to 40 tons per hour.

Lighter Jaw Crusher

A new 10 x 16-inch plain-bearing jaw crusher has been introduced by Pioneer Engineering Works, Minneapolis 13, Minn. It features a single-wall pressed-steel base that is said to be strong and rigid, yet lighter in weight. The pitman bearing is a full round bronze sleeve bearing. Side bearings are bronze on the bottom half and babbitt on the top half. Bearings are protected by felt oil seals in each end. Reversible jaw plates are of manganese steel. Production capacity ranges from 4 to 40 tons per hour, depending on the stage of reduction required. The approximate weight of the crusher is 3,350 pounds.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 641.

Folder on Surface Seal

A surface seal for blacktop, bituminous, and concrete pavements, as well as mastic floors, is the subject of a new brochure released by Maintenance Inc., W. Liberty St., Wooster, Ohio.

Because it is impervious to petroleum derivatives, sun, water, battery acids, and road salts, Jennite J-16 protects pavement surfaces in severest weather, according to the company. Several illustrations show city streets, parks, cemeteries, and school playgrounds on which the seal has been used. J-16, which is available in 5, 30, and 55-gallon steel containers, is said to be noninflammable, non-sticky, and easily cleaned; it requires no elaborate equipment for application.

This literature may be obtained from the company. Or use the Request Card at page 16. Circle No. 630.

Mann Appointed Armco Mgr.

Warren S. Mann has been appointed Manager of the Dixie Division of Armco Drainage & Metal Products, Inc., Middletown, Ohio. He succeeds Howard See, who retired last June. Mr. Mann, who has been Sales Manager since 1949, will have his headquarters in Atlanta, Ga.

There IS a Difference in VIBRATORS

CONTRACTOR'S SELECTION OF VIBER VIBRATORS *EXCLUSIVELY* ON SOME OF THE LARGEST JOBS IN THE COUNTRY PROVE THIS STATEMENT

We have found over the past thirty years that cost conscious contractors are switching exclusively to Viber Vibrators on every type of concrete construction.

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Viber Vibrators offer top performance day after day on the toughest jobs. Ability to absorb punishment comes from the built-in quality that comes only with research, experience, and manufacturing ability.

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Viber Company has progressively increased their line to provide all the equipment you need for smooth, low-cost operation. Interchangeability is an important feature of the Viber line.

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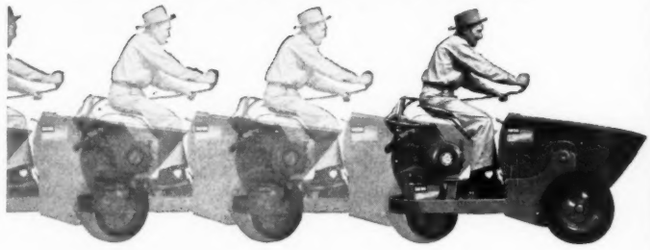

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Wyandotte Chemicals Corporation, Wyandotte, Michigan

Construction Starts On Snake River Dam

Road Relocation and Diversion Tunnels Start Palisades Job: Dam Is Bureau of Reclamation's Biggest Earth-Fill

By RAY DAY

• THE U. S. Bureau of Reclamation has started construction on the most massive earth-fill dam in its long history.

Known as the Palisades Dam Project, the huge 13,800,000-cubic-yard barrier will block Idaho's Snake River 7 miles upstream from Irwin, a small settlement in the southeastern part of the state not far from the Wyoming line. Conceived as a multipurpose reclamation project at a cost of $76,000,000, the dam will store irrigation water and draw another 114,000 kilowatts of electric power from the unruly river.

After many years of planning, exploration, and justification to Congress, the 1952 construction season marks the start of big-scale construction. The dam site is still covered with pines and quaking aspen, common to the dam's 5,600-foot elevation, but the hum of construction activity has begun.

The main contract for construction of the dam and appurtenant works was awarded to J. A. Jones of Seattle, and C. H. Tompkins of Washington, D. C., bidding as joint venturers. The initial contract for the relocation of 2½ miles of a 20-mile change of Idaho State Highway 29 was completed by Jack Olson Construction Co. of Rigby, Idaho. Jones and Tompkins subbed their portion of Highway 29's relocation to Kiely Construction Co. of Butte. Dillsworth & Pumnae of Butte subbed the relocation of 18 miles of U. S. Forest Service road along the south side of the reservoir. The Lee Union Co. subbed right-of-way clearing for the highway, the Forest Service road, and borrow area K, where some of the material for the dam is being secured.

J. A. Terteling & Sons of Boise was the successful bidder on two 31-foot-diameter tunnels under the left abutment. These included a power tunnel 1,210 feet long, and an outlet tunnel 1,580 feet long. The two tunnels will be used to divert the Snake River during dam construction. A hurry-up time schedule called for Terteling to be out of the way by August 31.

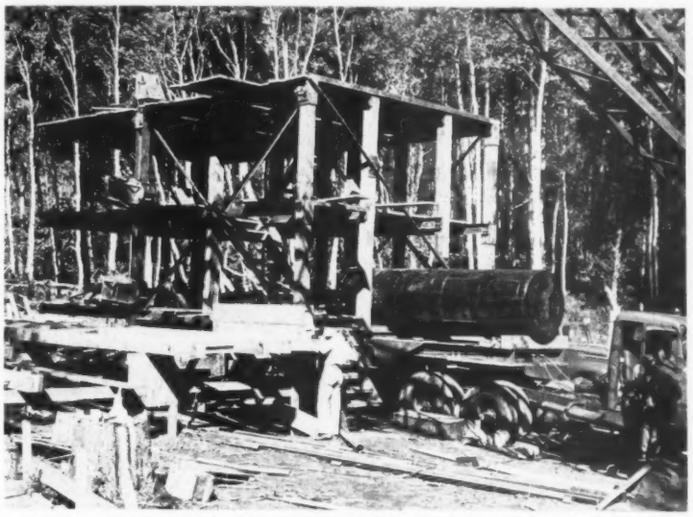
Interesting Highway Relocation

The highway relocation work by Jack Olson Construction Co., one of the interesting highlights of the project, was the first installment of several contracts which will be let eventually to complete the entire relocation. From 1945-1950, the sum of $3,470,000 was granted to start this relocation, construct a transmission line to bring electric power to the site, and erect a Government camp. Olson's 2½-mile relocation contract was bid at $310,000. The work was supervised by the Idaho State Highway Department for the Bureau of Reclamation.

Olson's men and equipment battled the job from September 1, 1949, to June 1, 1952, which gives some idea of how rugged construction conditions are at the dam. Snow can be expected at this altitude from October 15 to May 1. The 1949 construction season was so short that little was accomplished except a small amount of clearing, and the winters of 1950 and 1951 were both bad.

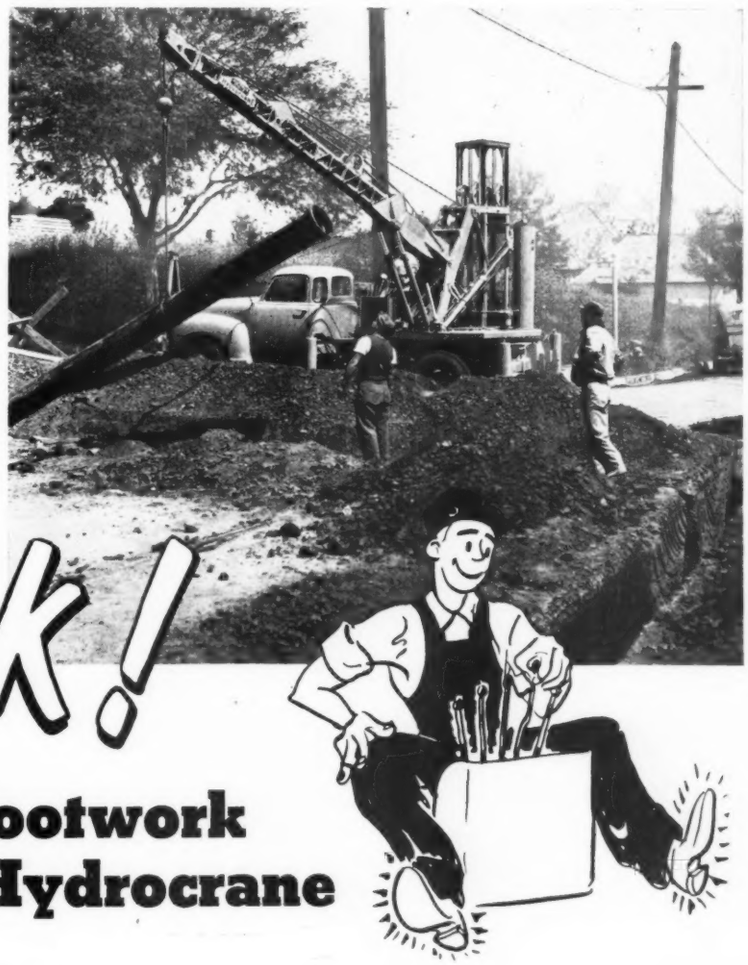
The first 2½ miles take the highway up in elevation from the old level to the new, which is well above the high-

(*Continued on next page*)



Workmen are busy on this Kenworth-mounted 4-level jumbo, which did the tunnel drilling. Joy hydraulic jibs are attached to the forward end of the machine.

Here the 3-ton Hydrocrane quickly uncovers pipe on an emergency leak repair job. Every crane function fully hydraulic — boom hoist, line hoist, swing, outrigger set and retract, boom telescope and bucket close. Six attachments available plus the HYDROHOE — *a drag-shovel front-end that is quickly and easily attached in the field.*



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no Footwork with a Hydrocrane

That's right. With this all-hydraulic Bucyrus-Erie Hydrocrane, it's strictly a finger-tip, hand-lever operation. No foot controls — no tricky hand-foot co-ordination required. No brakes and clutches that can grab and slip, either. And with liquid-smooth, cushion action hydraulic control, every crane movement is so precise loads can be moved a fraction of an inch at a time if necessary.

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220 N. 12th Avenue, Grafton, Wisconsin

Construction Starts On Snake River Dam

(Continued from preceding page)

water mark of the future reservoir. Olson's contract called for establishment of a 38-foot subgrade, which later on will receive granular subbase and 24 feet of bituminous paving. Maximum grade is 5 per cent. There were 400,000 cubic yards of common and 145,000 cubic yards of rock excavation in this first road job.

Except for a few areas in the new location, pioneering by conventional dozers was out of the question. The sidehill was too steep and rugged. It was also covered with a heavy growth of quaking aspen and evergreen trees, which had to be cleared before construction could start.

Hand-labor crews, using axes for clearing, did a great deal of the tree felling. Where it was possible, a D8-mounted dozer was used, but all too often it was a hand-labor job. The brush was burned on the site before grading began. A dozer pioneered a narrow access trail loaded with switchbacks up the side of the mountain approximately in the center of the project, so that excavation and clearing could work from two locations.

Roughing in the portals of the two diversion tunnels for Palisades Dam on Idaho's Snake River, the crew here is using a Gardner-Denver wagon drill.

The grading plan called for cuts and fills, with about 50,000 cubic yards of waste stockpiled for use in the dam. Pioneer work was done by a 1-yard Link-Belt Speeder power shovel, which worked ahead along the highway. A 1½-yard Link-Belt Speeder worked from the other side, and in some cases behind the smaller machine. These shovels loaded into 2 Koehring Dumptors and 2 Tournawagons, along with six 6-yard Ford, Mack, and Diamond T trucks, which carried the material away to fills of the waste pile.

In several places, hard outcrops of andesite appeared in the highway's path and had to be removed with drilling and powder. Drilling equipment included a Schramm 315 compressor and two Worthington wagon drills, with Timken steel and bits. Holes were bottomed at 2 inches, and then barrel-loaded with 65 per cent stick powder. Heavy loading was the rule, so the material would be well broken ahead of the shovels.

After battling the relocation for one construction season and parts of two more, Olson's crews finally turned in a beautiful piece of highway, from which future travelers can look down on the reservoir.

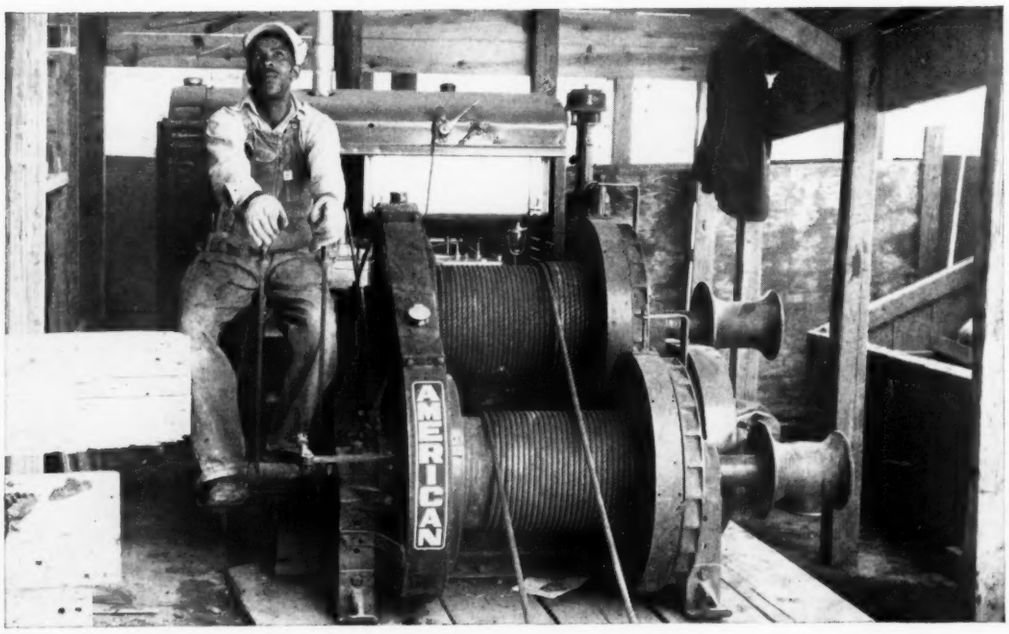
Tunnel Contract Let

Meanwhile, J. A. Terteling & Sons had established a camp near the tunnel portals, and was making the many preparations necessary for a tunnel drilling project of this size. Prior to opening of bids, supplemental notice was issued which required the contractor to furnish all steel supports. With steel in short supply, however, the contractor was not able to expedite the item. There was a possibility that they would be delayed by several months.

Terteling's men used the time to good advantage, however. Two Gardner-Denver wagon drills, powered by a 500-foot compressor, drilled the powder holes to face off the east portals of the 31-foot-diameter power outlet tunnels.

The permanent compressor building, housing six 500-cfm Fuller compressors driven by 150-hp General Electric and Allis-Chalmers motors, was rapidly

Business builder!



WHAT'S the best way for a contractor to build future business? Experienced men will agree that *keeping speed up and keeping costs down* is the answer.

This unit is a Model 55 2-drum American General Purpose Hoist. It lifts at high speed, and with perfect accuracy, because its welded structural steel base and side frames always keep shafts perfectly aligned. It's an easy machine to take care of; for example, clutch and brake bands are easily removed without disturbing the drum assembly. And it's always well lubricated because fittings are out in the open. Dozens of features of that kind make Americans the finest business-builders you can own. They speed up your work . . . keep operating and maintenance costs down . . . and *stay on the job*, under the toughest kind of punishment.

This is the broadest line of hoists made anywhere. For full information on any type, from 5 to 300 horsepower, see your American distributor.

Modernize...economize...with

American Hoist & Derrick Company

ST. PAUL 1, MINNESOTA

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American Hoist & Derrick Co.
St. Paul 1, Minnesota

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IF YOU CAN USE THE SHAKES ADVANTAGEOUSLY

—GET THIS VIBRO-PLUS "TOPDOG"* VIBRATOR

It's equipment of a thousand uses—for speeding the flow of materials through hoppers, bins, chutes—for vibrating tables or screens in packing, sorting or testing—for effective noiseless vibration in casting, mixing or loading—in fact, wherever a vibrating impact is useful, VIBRO-PLUS offers these exclusive advantages: Greatest ease of attachment—unsurpassed versatility—extreme lightness of weight—and real "heavy duty kick." Tell us your vibrating problems—we'll send you the proper bulletins.

*Reg. U. S. Pat. Off.

VIBRO-PLUS PRODUCTS INC.
54-11 Queens B'lvd., Woodside, L. I.

erected. A new Eimco 104 Rocker-Shovel and 4 new Koehring Dumptors were set in the yard, ready to go to work. About 1,000 feet up the road from the east portals, the first drilling jumbo was built. Mounted on a Kenworth truck for rapid moving, this jumbo was a steel and timber 4-deck affair. The top deck was rigged up with three Joy hydraulic jibs, fitted with Thor Model HA drills. Each of the three lower decks had four such jibs and drills, making it possible to spot a drill hole anywhere in the 31-foot face.

By the end of 1952, construction should be in full swing at this important dam in the USBR reclamation system, and since the Defense Electric Power Administration has classified the dam as essential to national defense, every effort will be made to push it through to completion during the next four seasons.

History and Purpose

Palisades Dam has one of the typical histories of large western reclamation projects. The first settlers to undertake irrigation in the Palisades area settled near Blackfoot and Rexburg, Idaho, in the 1870's. The fine volcanic soil, unbelievably rich, was irrigated from the start by direct diversion from the Snake River or its tributaries.

By 1900, more than 500,000 acres were under irrigation as farming expanded. The area was largely settled by Mormons, who are a thrifty, industrious people, and agriculture grew. Today, about 1,200,000 acres are under irrigation in the area, which is one of the most productive irrigated regions in the Pacific northwest.

To meet the water needs of the settlers, the Bureau of Reclamation was called on to construct 5 reservoirs in the Upper Snake River Valley. These have a combined storage capacity of 2,784,000 acre-feet, or more than 70 per cent of all the storage capacity in this area. The reservoirs built by the USBR include Lake Walcott on the Snake in Idaho, completed in 1909; Jackson Lake on the Snake in Wyoming, completed in 1916; American Falls on the Snake in Idaho, completed in 1927; and Grassy Lake on Grassy Creek in Wyoming, finished in 1939.

The drought period of the early 1930's emphasized the need of additional storage for lands already under irrigation in the valley. Investigations of various reservoir sites were made upstream from American Falls Reservoir to Jackson, Wyoming. The Palisades site was finally selected and initially authorized in 1941. World War II delayed progress, but gave the Bureau time to work out satisfactory water-saving agreements with the farmers in the Upper Snake River Valley. Under these agreements the farmers must stop running water through canals in some areas during the winter.

In 1949 the Bureau changed the original plan of development by increasing the power capacity, enlarging the outlet works, and adding recreation features to the project. Congress reauthorized the Palisades Project in September, 1950.

Thus, with construction of Palisades Dam, costly losses in crop production which periodically plague farmers in the valley are expected to end. These recurring losses on 650,000 acres have run as high as $3,000,000 to $7,000,000 in some years. The dam will also aid in the expansion of irrigation in southern Idaho by making available a full supply of water to two blocks of sagebrush-covered land—1,650 acres under the North Side Pumping Division of the Minidoka Project, and some 30,000 acres on the Michaud Flats Area.

Earth-Fill Design

Palisades Dam will be the Bureau's biggest earth-fill dam, from the standpoint of mass, although Anderson Ranch Dam in Idaho is a higher earth fill. It will back up a reservoir having a total capacity of 1,400,000 acre-feet, which will be a small body of water in relation to the Snake's tremendous flow. The Snake's flow is second only to the Columbia in the northwest, and the Columbia is known as the world's greatest power stream. The 1,000-mile Snake River originates in southern Yellowstone National Park, and flows southward between the Teton and Wind River Mountains in Wyoming for about 130 miles. After entering Idaho it turns westward through the Caribou and Snake River Mountains, and emerges close to the Palisades site at Heise, Idaho. Below Heise, the big stream crosses southern Idaho in a broad arc.

Palisades Dam will be a rock-faced earth-fill structure having a total volume of approximately 13,800,000 cubic yards. The structure will be approximately 200 feet high, 2,200 feet long at the crest, 2,250 feet wide at the base, and 40 feet wide at the crest. The crest elevation will be 5,630 feet above sea level.

A controlled-discharge type of spillway, consisting of one 28-foot ID tunnel 1,850 feet long, will carry surplus flows of the Snake past the dam. It will extend from the surface of the reservoir through the left abutment to the river below, and will have a maximum capacity of 48,000 cfs. Control will be by means of two 20 x 5-foot radial gates.

Two concrete tunnels lined with steel from dam axis to the outlet end constitute the outlet works. They have a capacity of 30,000 cfs at reservoir elevation 5,497. Each of the two diversion outlet tunnels has a finished inside diameter of 26 feet. One tunnel carries water to the penstocks to generate power; the other is an outlet tunnel.

(Concluded on next page)

BATTERY-OPERATED
GREASEMASTER

G and T

- Attaches to any vehicle.
- 25 foot of high-pressure hose.
- Automatic switch controls any pressure setting up to 3,000 p.s.i.

★Weighs less than 40 lbs. Can be carried anywhere.

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HERE'S WHAT ONE LEADING CONTRACTOR HAS TO SAY ABOUT FLEX-PLANE'S SUPER PORTABLE FINISHER . . .

DENTON CONSTRUCTION COMPANY
GENERAL MOTORS BUILDING
DETROIT 2, MICHIGAN

March 6,1952.

Mr. Donald T. Heltzel
General Manager
Flexible Road Joint Machine Company
Warren, Ohio.

Dear Sir:

We have been using two of your "Detroit Special" finishing machines on numerous projects in and around the City of Detroit for the past two years. Our overall experience with these machines has been very satisfactory. Following are some of the advantages we have found.

(a) Most important is the increased production due to higher rate of travel and screed action.
(b) The hydraulically operated moving mechanism reduced our job to job moving time to an absolute minimum.
(c) Changing width of machine and screeds for various pavement designs is accomplished readily due to built-in features which facilitate same.
(d) Balance and flexibility has proved to be excellent. On one test track job, a 200 ft. radius curve with 42 inch super-elevation in 12 feet was negotiated without difficulty and handling "no slump" concrete at the same time. In this case we attribute such performance in part, to the very fine turning clutches.
(e) Strength has not been sacrificed although total weight has been reduced sufficiently to permit operation on 13 inch light-construction forms and integral curb work.
(f) Power-plant, clutches, gear boxes and hydraulic controls perform perfectly and reflect superior design and construction.
(g) Last but not least is the low maintenance experience we have enjoyed, plus a definite attitude on the part of the manufacturer to "serve-after-sale".

Obviously the sum total of these factors mean dollars and cents in any owners' pocket.

Sincerely yours,
DENTON CONSTRUCTION COMPANY
By C. O. Leduman
C.O. Leduman - Gen'l Supt.

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The Detroit Special Portable Finishing Machine is the most mobile, sturdiest, easiest-to-use — most profitable finisher on the forms today. In many cases the Special has completely paid for itself on the first job. Get all the information. We'll be happy to furnish you with bulletins or movies, arrange interviews with owners, give you full technical assistance and engineering help.

Just write to **Detroit Special, Flexible Road Joint Machine Co., Warren, Ohio.**

Flex-Plane

The Flexible Road Joint Machine Co.
WARREN, OHIO

Heltzel

Construction Equipment Since 1910

Construction Starts On Snake River Dam

(Continued from preceding page)

The Palisades power plant will be built at the downstream toe of the dam at the left abutment. It will house four generators, each rated at 28,500 kilowatts. The estimated annual output of primary hydroelectric energy will be 134,000,000 kwh, with 387,000,000 kwh of secondary energy.

Present demands for Palisades power already exceed the firm output of the plant. Use of electric energy in eastern Idaho has shown a steady increase, particularly during the postwar period. Some power companies are now installing diesel-electric generators to meet the growing shortage, and Idaho Power Co. is investing many millions of dollars in private capital to add new capacity to its system. Both the City of Idaho Falls and REA cooperatives have asked for power from Palisades. The construction of the Atomic Reactor Plant west of Idaho Falls has added a new demand for power—and, ironically, has also predicted the ultimate solution for electric-power generation, for the first atomic-generated electric power is already a reality on a small scale.

The Palisades reservoir, 21 miles long and 3 miles wide at its broadest point, will have a surface area of 16,100 acres. Some valuable farmland will be lost forever as a result of the dam's construction, including 2,700 acres of irrigated land, 4,100 acres of dry-farm land, 1,000 acres of sagebrush, 3,300 acres of timber, and 1,100 acres of riverbed.

The left abutment of the dam will rest on andesite, common in the Upper Snake River Valley. The rock is very hard and stable, and will make an excellent foundation for the dam and its companion structures. This formation can also be used as a source for riprap and rock fill. Portions of the dam which will not be underlain by andesite will rest on highly compacted but uncemented clayey sands and gravels which are impervious to percolation of water.

Earth for the various zones of the dam embankment is available directly adjacent to the dam structure. Concrete aggregate materials are adjacent to the power-plant structure. Considerable crushing and processing of these materials will be required.

During construction, the Snake will be diverted by a high cofferdam through Terteling's two tunnels.

As construction operations unfold on this important structure, new developments in engineering and construction techniques may be expected. As the various operations get fully under way, they will be reported in future issues of CONTRACTORS AND ENGINEERS MONTHLY.

DeSmet With Willys-Overland

Cam A. DeSmet has been appointed Assistant Regional Sales Manager of Region 3 for Willys-Overland Motors, Inc., Toledo, Ohio. His headquarters will be in Chicago.

R. J. S. Pigott, left, President of the American Society of Mechanical Engineers, presents a scroll of congratulations to Col. Carlton S. Proctor, President of the American Society of Civil Engineers, which celebrated its 100th year this month in Chicago.

ASCE Celebrates Centennial

From September 3 to 13, Chicago was host to some 30,000 convention delegates, including 500 engineers from Europe, South America, and Asia. The attraction was the centennial celebration and convocation of the American Society of Civil Engineers. Almost 1,000 papers were presented and 12 symposia sessions held. September 10, Centennial Day, was highlighted by the presentation of the John Fritz medal to Benjamin F. Fairless, President and Chairman of United States Steel, and the Hoover Medal for distinguished public service to Clarence D. Howe, Canadian Minister of Trade and Commerce and Defense Production.

Before the Centennial celebration, representatives from the Marshall Plan nations, Italy, Western Germany, and Switzerland, converged on New York City for a series of engineering programs. Following the Centennial celebration, this group divided for some 25 tours, lasting two weeks, in which they will visit major American engineering enterprises including farms, factories, highways, sewage-treatment plants, and American engineering schools. Representatives of the Marshall Plan countries were the guests of the Mutual Security Agency.

Directors of the nonprofit Centennial of Engineering, 1952, Inc., created for the occasion, included Herbert Hoover, Charles F. Kettering, Benjamin F. Fairless, and many others.

Folder on Motor Graders

Construction features of Adams motor graders are presented in a new 4-page folder. The eleven operating advantages illustrated include fast changing from ditch to bank cuts, blade clearance, rigid scarifier, and easily adjustable blade. The folder also points out that the engine is started from the cab, it transmits power for 8 forward speeds, and on some models can move the grader up to 25 mph.

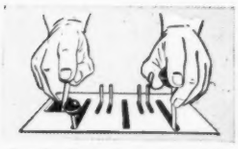
This literature may be secured from J. D. Adams Mfg. Co., P. O. Box 853, Indianapolis, Ind., or by using the Request Card bound in at page 16. Circle No. 647.

"Best money I ever spent,

was when I bought my K-595," says Canadian coal stripper

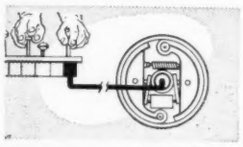
STRIPPING COAL NEAR CHIPMAN, N. B., is a K-595 Link-Belt Speeder 3-yd. dragline with 90' boom owned by Willard Wasson. Overburden runs from 12' to 50', the seam from 12" to 24". The K-595 works two 9-hour shifts daily, averages 120 tons of coal per shift. Operators Calvin Austen and Harold Naugler say it's the finest dragline in the Mento and Chipman fields—easy to operate and always ready.

These Link-Belt Speeder PLUS FEATURES speed output, cut downtime



Speed-o-Matic Controls — fully hydraulic! You "feel" the load all the way. Simple, easy—fingers instead of muscles do work.

Eliminates up to 150 parts—cuts friction, no worn bushings, pins, links or clutch toggles to put you "down."



Speed-o-Matic Clutch—hydraulically actuated, simple, smoothly responsive. Runs cool. Eliminates need for frequent adjustments.

Service—fast, efficient. Link-Belt Speeder Service is nationwide—near you with replacement parts, factory-trained mechanics.

LINK-BELT SPEEDER
CORPORATION
Builders of the most complete line of shovels, cranes and draglines
CEDAR RAPIDS, IOWA

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MESSENGER
CONCRETE VIBRATORS and GRINDERS

A few exclusive dealer territories are available.
Messenger Vibrators
FRANK D. MESSENGER
P.O. Box 124
FAIR HAVEN, MICH.

Use "Messenger" Service

Bulletin on 100-Ton Jack

A new bulletin on a 100-ton jack for heavy-duty automotive and construction work has been released by Bee Line Co., 2501 Lincoln, Davenport, Iowa. The jack is a lightweight unit with collapsible handles for easy positioning. The bulletin points out that remote control makes it easy to use where there is limited working space.

Dimensions listed include an 8-inch base diameter, 13⅜-inch collapsed height, 19⅛-inch extended height, and 144-pound ram.

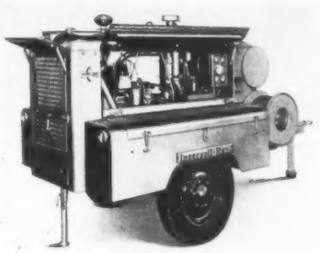
This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 588.

Portable Compressors

Introduction of 315, 210, and 105-cfm Gyro-Flo portable compressors with rotary sliding vanes is announced by Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. Smaller dimensions, greatly reduced weight, and discharge temperatures at least 100 degrees lower than conventional portables are advantages claimed by the manufacturer.

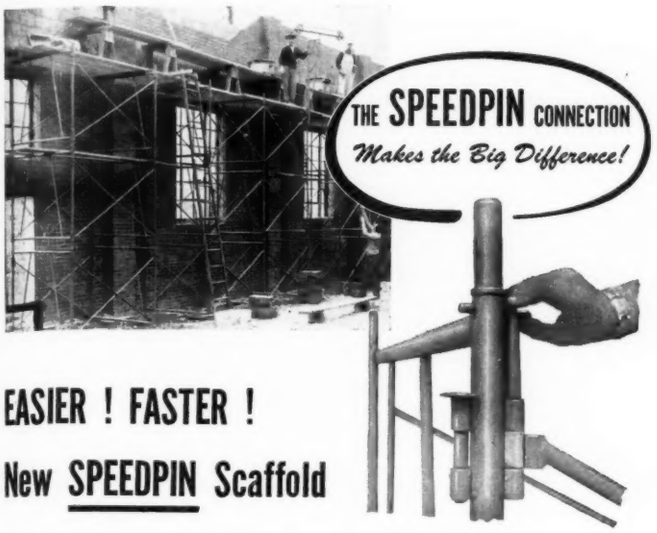
The two-stage, oil-cooled rotary sliding-vane design is said to eliminate most of the problems of reciprocating units for portable service. There are no valves to leak, no pistons, rings, rods, or clutch to wear. Air discharge at less than 200 degrees, under normal operating conditions, together with thorough oil separation, eliminates hose deterioration caused by heat and oil. The continuous rotary action provides a steady flow of air without vibrations.

A stepless system controls the air output over the full range from 0 to 100 per cent capacity. Throughout the entire capacity range the air pressure stays between 100 and 110 psi to assure uniform work. The 315 and 210-cfm sizes offer a choice of either GM diesels or Continental Red Seal gasoline engines. The 105 uses a Continental gasoline engine.



One of Ingersoll-Rand's new portable compressors. The two-stage, oil-cooled, rotary-sliding-valve design eliminates such problems as leaking valves, worn-out pistons, rings, etc.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 568.



EASIER ! FASTER !

New SPEEDPIN Scaffold

Obsoletes All Other Types Of Scaffolds

Here's the newest, safest, most efficient scaffold on the market today. The Hagan Speedpin Tubular Steel Scaffold goes up fast . . . is easy to erect . . . cuts job costs because of its simple basic design, unusual flexibility, and great strength. With all-welded construction throughout, it has no loseable parts, chains or pins. And with no stems or plates that might become bent, you have easier, neater storage and stacking in the shop, on the truck, or at the job site.

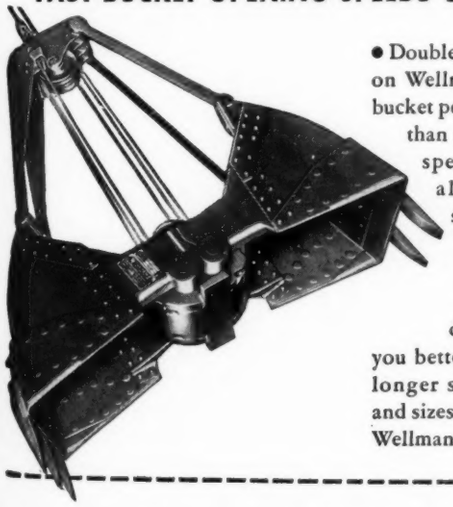
The new Hagan Scaffold includes all the advantages and features suggested by construction and maintenance men in the field . . . so, naturally, it's your best bet for speed, safety, simplicity, and economy. Write us today for descriptive literature and name of nearest dealer. (Dealerships are open, incidentally, in a few selected territories.) Your note or letter will bring a prompt reply.

HAGAN TUBULAR PRODUCTS

P. O. BOX 2272 • YOUNGSTOWN 4, OHIO

WELLMAN *Williams Type*

FAST BUCKET OPENING SPEEDS OPERATIONS



• Double-hinge construction on Wellman's multiple-rope bucket permits faster opening than a single hinge. This speeds up operations, also gives a bigger spread in the open bucket for the same headroom.

Wellman's welded-design buckets offer you better performance and longer service. In all types and sizes you'll do better with Wellman!

Want Facts? Write for free descriptive bulletins.

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How Tuffy® Can Help You CUT COSTS 3 WAYS

—on Dozing, Scraping & Dragline Operations

❶ ELIMINATES UP TO 75% OF DOZER ROPE WASTE!

Tuffy DOZER ROPE

Stop wasting 40 or 50 feet of good rope whenever 10 feet or so become crushed or cut on the drum. Mount a reel of Tuffy Dozer Rope just back of the wedge socket . . . feed just enough new rope through the socket to *replace only the damaged part.* ½" rope available in 150' reels.

❷ "33⅓% MORE SERVICE" reported by users of

Tuffy SCRAPER ROPE

Save on replacements! Tuffy's ability to handle extra yardage means more days of service, lower material handling costs. Test Tuffy on your equipment. When you order, simply give length, diameter and the name "Tuffy!"

❸ "...200,000 Yds. Expected—But went 432,371 Yds.!" reported by a user of

Tuffy DRAGLINES

Proved ability to give longer service life with fewer delays on the job. Use Tuffy for digging, casting or loading—handling *any* material. See how its extra flexibility and stamina help you cut costs. Easy to order: just give length, diameter and "Tuffy!"

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New Lubricating Oil For Diesel Engines

Diesel engines operating on construction jobs under severe conditions impose special lubrication problems. Oil designed for average conditions is not capable of maintaining the serviceable life of such an engine. In addition, high-sulfur fuels, aggravated by low-temperature operation, promote ring sticking and piston deposits.

To meet these severe conditions, Shell Oil Co. has introduced Rimula oil. According to the company, field tests show that:

(1) It is desirable where engines are using high-sulfur fuels.

(2) Piston lacquer and ring sticking can be eliminated while ring and liner wear are reduced through the use of this oil on heavily loaded high-output, high-speed, and large slow-speed engines.

(3) The oil will materially reduce engine deposits resulting from the use of fuel having poor combustion characteristics.

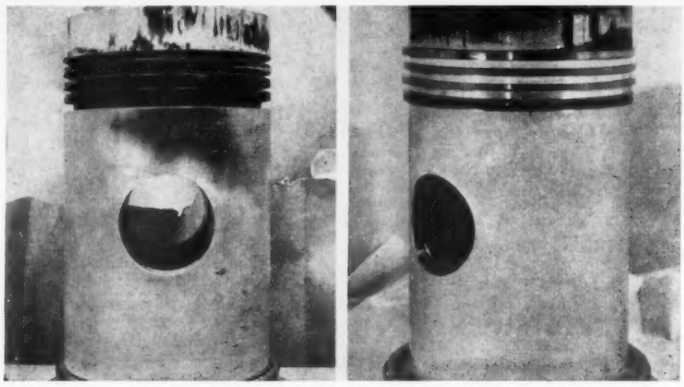
(4) It also eliminates sludge and reduces engine wear on intermittently operating, lightly loaded, cold-running engines.

(5) The length of drain periods can be considerably extended and lubricating-oil consumption reduced.

In these field tests the new oil was compared with conventional heavy-duty lubricating oils of the 2-104B type and close records were kept of engine conditions, oil consumption, additive depletion, and piston conditions. At Phoenix, Ariz., two 6-cylinder diesel tractor engines, operating side by side under the same dusty working conditions and following the same work schedules, were selected for tests. The photo shows 2 pistons taken from one of the engines. The piston on the left operated about 2,400 hours, made up of twenty 120-hour drain periods, on a high-level heavy-duty oil, and shows wear and deposits typical of normal operation on this type of service. The piston shown at the right operated about 2,664 hours, with six 120-hour and eight 240-hour drain periods, on the new Series 2 lubricating oil. Both cylinder and ring wear were materially reduced and deposits were held to a minimum. The slow rate of additive depletion, very satisfactory over the extended drain periods, assured cleanliness and wear control with a comfortable margin of safety.

In another test, one piston ran for eight 120-hour drain periods on a conventional heavy-duty oil. Wear and deposits were slightly below normal for this run. The other, running seven 120-hour and four 500-hour drain periods with Rimula oil, showed greatly reduced wear and deposits and attained a 1 per cent top-ring-groove carbon. These positive results were mostly impressive because of the economical and considerably extended drain periods.

Other tests on diesel engines with large-capacity crankcases operated with even longer drain periods—up to 1,500 hours—with the same comparative results. Again, with the highly fortified oils, ring sticking was eliminated and wear greatly reduced. Additive quality at the end of the drain periods indicated that the oil could have gone on and successfully offset the acid products of combustion. However, it was decided that the drain periods had been extended sufficiently to maintain operating economy.



Two tractor pistons, both in operation for about the same number of hours—but the one at the left used a regular heavy-duty lubricating oil and the one at the right, Shell's new Rimula Series 2 oil

According to the company, the field tests show that Shell Rimula oil not only meets severe operating requirements but gives a greater oil economy per thousand hours of operation through extended drain periods alone. Reduced down-time and repairs account for more saving.

Further information may be secured from the Shell Oil Co., Inc., 50 W. 50th St., New York 20, N. Y. Or use the Request Card at page 16. Circle No. 563.

Denniston for Kelly & Gruzen

George F. Denniston has joined the firm of Kelly & Gruzen, Architects-Engineers, New York, N. Y., as Executive Manager. Mr. Denniston was formerly with the architectural firm of Eggers & Higgins. He is an associate member of the American Institute of Architects, and is on the board of governors of the New York Building Congress.

GOLD WINCH

¾ TON CAPACITY
1001 USES!

Holds 100 Ft. 1/4-In. wire rope. Two speeds: 8.16 to 1 for heavy loads, 3 to 1 for fast operation. Electric steel, bronze bushed.

$33.00 less rope

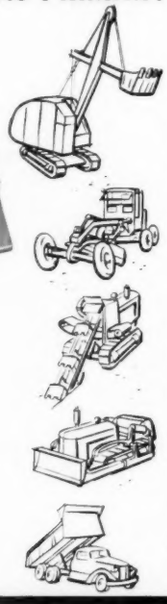
$43.45 with 50 Ft. ¼-In wire rope.

GUARANTEED—five day return privilege. Send remittance with order and we pre-pay shipping. If your distributor doesn't have the GOLD WINCH, send for literature and information:

WRITE GOLD FOUNDRY & MACHINE WORKS
1616 S. Osage • • Independence, Mo.

"I don't see how we could operate without Motorola 2-Way Radio"

MORE THAN EVER—
MAINTENANCE AND CONSTRUCTION MEN CONSIDER
INSTANT 2-WAY RADIO AS PRIMARY "OPERATING MACHINERY"!



A Hard-Hitting, Quickly Applied Construction Tool.

The Uni-Channel can be used as a fixed or fully mobile station. Easy to set up and easy to operate. Just plug in, connect antenna and go to work. The Motorola Permakay filter eliminates 15 nuisance tuning adjustments forever.

In any wide-spread, hard-driving operation you can count on Motorola 2-way radio to get machines and men on the job faster, keep supplies moving. Motorola mobile radio will streamline your operation, boost your efficiency.

More and more construction men are finding that Motorola equipment pays for itself after only a few months' operation. Motorola engineering gives you dependable performance, lowest maintenance costs and obsolescence-proof circuits that protect your investment for years to come.

Motorola

Communications & Electronics Division
4545 Augusta Blvd., Chicago 51, Illinois
Rogers Majestic Electronics Ltd., Toronto, Canada

The Sharp-Smith sharpens circular saws, planer and jointer knives, sand plane irons, wood chisels, etc.

New Sharpening Unit

A new sharpening unit for circular saws, planer and jointer knives, hand plane irons, wood chisels, and other cutting tools has been announced by Belsaw Machinery Co., 315 Westport Road, Kansas City 2, Mo.

The Sharp-Smith is said to joint, gum, bevel-grind, and set all popular types of circular saws from 4 to 48 inches in diameter. With height and bevel adjusted, it will sharpen planer and jointer knives up to 24 inches long. An entire set of knives can be sharpened without touching either adjustment, the company says; this assures that each knife will be jointed and bevel-ground the same way as all the others in the same set.

The Sharp-Smith has a positive setting for jointing circular-saw teeth to perfect round, and another positive setting for grinding the gullets to uniform depth. This assures that the saw is in perfect balance and will run smoothly and evenly without wobble or vibration, the manufacturer claims.

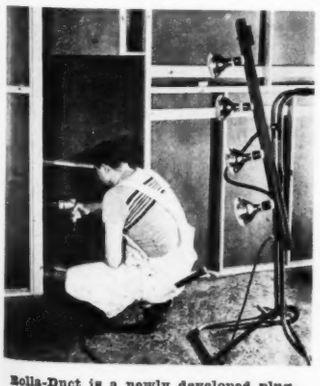
Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 589.

Power and Light Head

A series of portable branch circuit extensions that supply power, light, or heat have been announced by National Electric Products Corp., Chamber of Commerce Building, Pittsburgh 19, Pa. The collapsible Rolla-Duct includes a power and light unit, a strip of floodlighting, and a strip of infra-red heating units. The strips are fully grounded and are provided with a circuit breaker.

The portable assembly consists of a 3-foot 10-inch strip of No. 1700 Surfaceduct, swivel-mounted on an all-steel tubular carriage. The unit's wheels are made of special materials that are nonconductive, and which resist chemicals, moisture, and oil. The carriage-mounted duct is carried on a ball-and-socket swivel that locks into any horizontal or vertical position. It may be elevated to a height of 5½ feet, or the carriage may be collapsed to roll under jobs. The portable assembly is provided with a 21-foot power line of 3-conductor heavy-duty cable. It will carry an approved rating for 20-amp loads for 115-volt operations.

Further information may be secured from the company, or by using the Request Card at page 16. Circle No. 560.



Rolla-Duct is a newly developed plug-in power and light tap device made by National Electric Products Corp. It consists of an approved series of portable branch circuit extensions mounted on an all-steel tubular frame.

Line of Generator Plants

An 8-page catalog on portable and stationary generator plants is available from Master Vibrator Co., 100 Davis Ave., Dayton 1, Ohio. It illustrates and gives complete details on the company's line of gasoline or diesel electric units. Plants are made in 22 basic sizes from 500 to 17,000 watts for ac or dc power and lighting. Pushbutton or remote controls are also available.

This literature may be obtained from the company, or by using the Request Card that is bound in at page 16. Circle No. 567.

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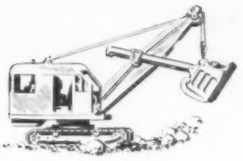

Torrington Spherical Roller Bearings — used as original equipment on virtually every type of construction machinery—are ideal for any service needs.

These rugged, self-aligning bearings are made from selected quality steel — to precision tolerances, assuring smooth performance and long service life.

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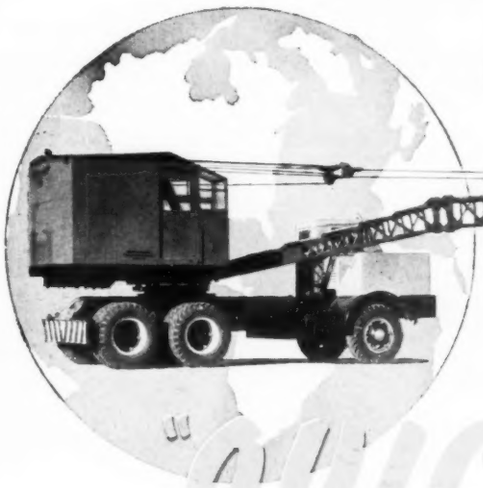

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The World's Leading Truck Shovel

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"QUICK-WAY", the original truck shovel and always the standard, has for 30 years demonstrated its versatility and adaptability, as well as its superb engineering and long lasting construction — not only in the United States but in 65 foreign countries as well.

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You can mount basic unit on your own truck or purchase complete with your choice of trucks.

Model L 10 Ton Crane, ½ Yd. Shovel, 7½ to 10 Ton Truck
Model E 7½ Ton Crane, 4/10 Yd. Shovel, 5 to 7½ Ton Truck
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Model J 3 Ton Crane, ¼ Yd. Shovel, 1½ to 2½ Ton Truck

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Please send me complete details on "QUICK-WAY" truck shovels—four different models for large jobs and small.

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Steinman's Advice Is Sought On Three Suspension Bridges

Plans for building two suspension bridges and modernizing a third are on the schedule of Dr. D. B. Steinman, consulting engineer of New York, N. Y.

The Board of Commissioners of the Port of New Orleans, La., has retained Dr. Steinman to make studies and report on the feasibility and approximate cost of a four-lane suspension bridge across the Mississippi River at New Orleans. The Board requires studies and estimates for alternate designs with main spans of 1,800 and 2,000 feet and vertical clearances of 135 and 150 feet, respectively.

The other proposed new bridge is in France. It is the Tancarville Bridge to be built over the lower Seine between Rouen and Le Havre at an estimated cost of $20,000,000. This 2,000-foot-span suspension bridge will be the largest in Europe. A syndicate of leading French construction companies has retained Dr. Steinman, and his immediate job is to complete the design of the cables, anchorages, and suspension system, prepare quantity and cost estimates, and assist the group with its detailed proposals and tenders. If these companies secure the contract, Dr. Steinman will be Consulting Engineer on the project. Aerodynamic stability is an important factor, as well as artistic design, in the estimates for both the Mississippi and Seine bridges.

The Covington-Cincinnati suspension bridge over the Ohio River, completed in 1867 by John A. Roebling, and the greatest bridge in the world at that time, is due for modernization. Dr. Steinman is taking over the work following his reconstruction of Brooklyn Bridge. He will make an examination and report and prepare recommendations for modernizing the 1,057-foot-span bridge.

Last June Dr. Steiman was the recipient of the coveted bronze plaque of the National Society of Professional Engineers, for distinguished service in the engineering profession. He is the second person ever to receive this award. The only other engineer so honored was ex-President Herbert Hoover, whose work the Society holds in high esteem.

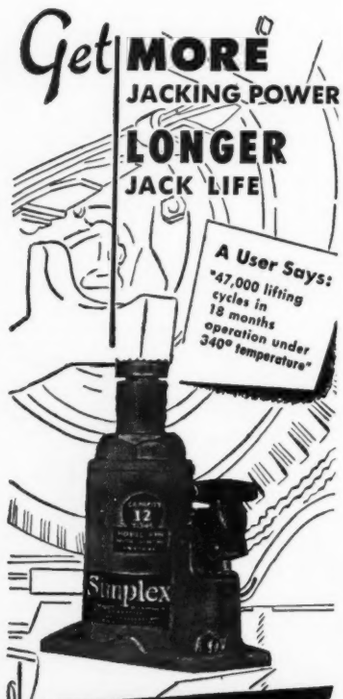
Data on Utility Buildings

An 8-page booklet on all-steel utility buildings is issued by United Steel Fabricators, Inc., Wooster, Ohio. Illustrations show various styles and applications of the prefabricated structures, together with steps in erection. Descriptive matter covers design features, full specifications, and complete details on the USF clip-and-wedge assembly. Drawings of the six standard wall panels, with information on how to plan your own building, are features of the booklet. It also gives information on the Handy Hut, a small portable or permanent steel utility building.

This literature may be obtained from the company by requesting Bulletin No. 1, or by using the Request Card at page 16. Circle No. 577.

Orban Elects Shiro V. P.

Charles H. Shiro is a new Vice President of Kurt Orban Co., Inc., New York, N. Y., importer of metals, machine tools, and industrial equipment. He is also Vice President and a director of Larssen Sheet Piling of Boston, Inc., Larssen Piling Corp., New York; European Machinery Ltd., Canada; and an officer of Jersey Steel & Chemical Corp., New Jersey. Mr. Shiro joined Orban as a sales engineer in 1950. He was formerly with Great Lakes Dredge & Dock Co. and the Bridge Division of J. A. Roebling's Sons.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A User Says:
"47,000 lifting cycles in 18 months operation under 340° temperature"
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Dependable performance, day after day on difficult jobs, produces reports like these from Simplex Hydraulic Jack users. Engineered for faster, safer jacking, with no maintenance cost, every Simplex Hydraulic has these superior features:

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HORIZONTAL or VERTICAL OPERATION with double lever sockets to speed work.
SMOOTH ACTING RAM of SAE X1112 steel, machined and ground to minimum tolerance.

Put a Simplex Hydraulic to work on your tough jacking jobs to save time and manpower. Available in eight models with capacities from 3 to 100 tons — safety-tested to 50% over rated capacity.

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Simplex LEVER • SCREW • HYDRAULIC Jacks
TEMPLETON, KENLY & CO.

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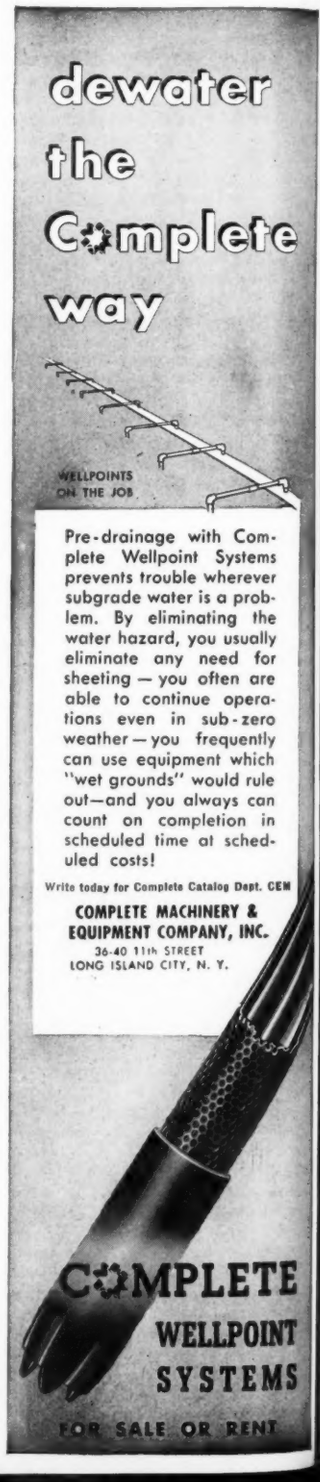
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Navy Research Teams Build a Soil Vibrator

Compaction of Beach Sand Is a Certainty With New Rig; Scientists Now Search for Answers in Plastic Soils

By PROF. FRED'K J. CONVERSE, California Institute of Technology
With RAY DAY

• IN the center of a sandy proving ground at the Navy's Construction Battalion Center at Port Hueneme, Calif., a mechanic in coveralls stepped up to a skid-mounted Chrysler engine hooked to a Vickers hydraulic pump. He cracked a couple of hydraulic valves and opened the throttle. As he did so, what may turn out to be a new chapter in soil compaction was written.

The engine's growl changed to a roar. Engineers and scientists glanced in satisfaction at each other as powerful vibratory forces shook the earth for 200 feet around the deceptively small machine. One man, suddenly sick at his stomach, hurried away from the violent oscillations, which already were causing the machine to sink down into the earth.

What these men were witnessing was an experiment in the compaction of soil by resonant vibration. What they saw was the pilot model of a machine which may, some day, turn compaction inside out. The machine has already turned in satisfactory results in sand and gravelly material. It has not, however, been developed for plastic soils. While further experiments and studies are now under way in that direction, nothing conclusive has been learned.

Development of the vibratory compactor is a research project of the U. S. Naval Civil Engineering Research and Evaluation Laboratory of the U. S. Navy Bureau of Yards and Docks. The California Institute of Technology, Pasadena, Calif., is the contractor. The working model of the first machine was fabricated in the North Hollywood shops of Clyde Wood Mfg. Co., builder of the Wood Roadmixer and other conventional highway-building equipment.

Developed for Military Need

The machine is being developed primarily to meet a need fast becoming critical for some type of lightweight equipment which will compact subgrades sufficiently to hold modern airport traffic. For, as airplanes grow larger, tire pressures increase and wheel loads get heavier. The development of high-density subgrades to considerable depths under pavements is now the function of sheepsfoot rollers, 50-ton compactors, and even 120-ton supercompactors.

Military engineers have long been concerned about the growing sizes and weights of conventional earth-processing equipment, especially when they think in terms of construction work in forward areas at overseas bases. The Laboratory's research program with CalTech is aimed at producing a lighter machine which will develop the required densities in a shorter time. To the engineers in charge of this development, the solution appeared to be vibration compaction.

Past attempts to develop a vibratory compaction machine have not been too successful. However, much of the trouble seems to have come from a lack of knowledge of the basic laws governing the compaction of soil by vibration.

CalTech was in an enviable position to undertake the Navy assignment. From September, 1948, to March, 1950, it had worked on a study sponsored by the Department of the Army, Engineer Research and Development Laboratories, Fort Belvoir, Va. This study was primarily basic research to develop a method for calculating the resonant frequency of the entire system in terms of the vibrator loads and dimensions, along with certain elastic constants of

(Continued on next page)

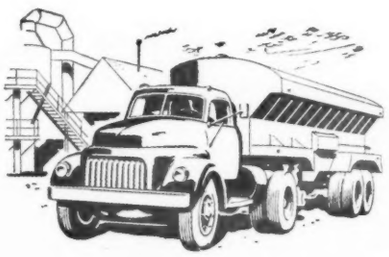
Official U. S. Navy Photo

The new vibratory soil compactor gets a workout at the proving ground of the Navy's Construction Battalion Center at Port Hueneme, Calif. Developed by naval engineers, its primary purpose is to compact subgrades to hold modern airport traffic. The California Institute of Technology, Pasadena, Calif., was the contractor.

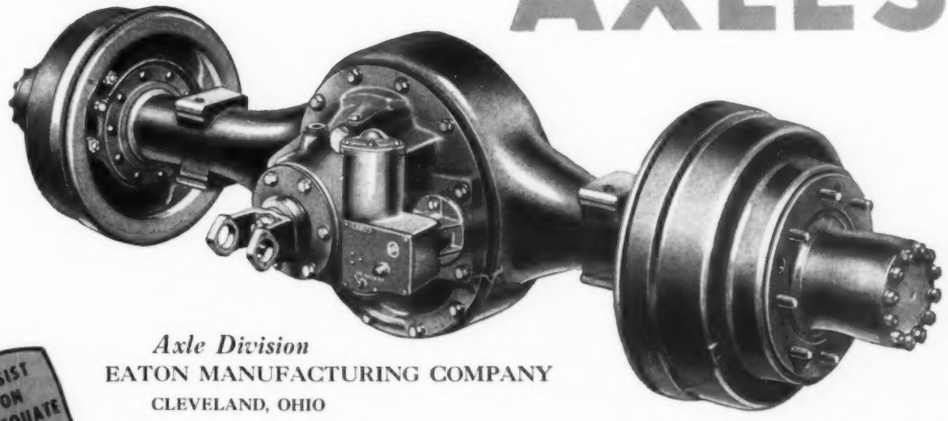
Eaton 2-Speeds cut hauling costs

Eaton 2-Speed Axles provide a gear ratio for every load and road situation; permit engines to run in the most economical speed range; reduce stress and wear on engines and power transmitting parts. This means lower cost right down the line: through reduced operating and maintenance costs, through faster trips, through longer truck life. And Eaton 2-Speed Axle trucks are worth more on the trade-in.

Let your truck dealer explain how Eaton's exclusive planetary gearing, forced-flow lubricating system, and positive shift control keep trucks on the job without expensive axle repairs.



EATON 2-Speed Truck AXLES



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Today, America's roads are crowded with twice the traffic they were designed to carry. Help end the national traffic jam by speaking up for more and better roads.

For the Finest in Chain Saw Performance — Lombard Model 7 Two Man Saws with new Warren High Speed Chain

Dept. 7 — 12% more power 10 lbs. lighter weight

LOMBARD GOVERNOR CORP.
ASHLAND, MASSACHUSETTS

Navy Research Teams Build a Soil Vibrator

(*Continued from preceding page*)

the soil. The complete system, which includes the vibration mechanism and the soil being vibrated, is called the vibrator-soil mass.

What does "resonant frequency" mean? Simply that the natural frequency of the vibrator-soil mass is the same as the rotation of the vibrator eccentrics. Since maximum dynamic displacements occur at resonant frequency, it was reasonable to expect the best soil compaction at that point. A second objective was to measure the degree of compaction, and the depth to which the soil could be compacted.

Two-Angle Approach Used

Two methods of approach were used. The first was purely theoretical, and required simplifying assumptions regarding the character of the soil to make the mathematics possible of solution. The second approach was experimental, and involved tests in a pit 10 feet square and 6 feet deep, filled with sand. The theoretical studies, correlated with the field tests, soon suggested an empirical formula.

The Belvoir field tests were made by placing a vertical oscillator on circular steel plates of various diameters and running it at frequencies from 7 to 30 cycles per second. Dynamic forces from 300 to 1,200 pounds were used, and the dead load of vibrator and plates varied over about the same range.

In these tests the frequency was gradually increased and the resonant frequency was assumed to have been reached when the rate of settlement was at a maximum. The resonant frequency was easily recognized by observing the violence of the oscillation. No difficulty hampered the determination of resonant frequency to within half a cycle per second.

Several important factors were found to influence the resonant frequency. The magnitude of the dynamic force, weight of the oscillator, size of the base plate, density and shearing modulus of the soil—all influence it. A formula involving these variables was developed as a result of the tests. The resonant frequencies predicted by this equation agreed closely with all values determined experimentally, including several observations made on a compact beach sand, using base plates 19 and 45 inches in diameter.

The extent and depth of compaction resulting from resonant vibratory compaction was then measured by comparing in-place densities before and after vibration. A penetrometer, or drive rod, calibrated to measure densities in terms of the number of blows of a standard weight falling through a standard height, was used for this purpose.

The design and testing of the larger-size Navy vibrator was undertaken with considerable enthusiasm following these preliminary tests.

The New Vibrator

The new vibrator has a base area of 15 square feet and a maximum dead weight of 6.6 tons, of which 2 tons is in the form of removable plates. The machine produces vertical dynamic forces by means of two shafts rotating in opposite directions and carrying eccentric weights. This design enables the horizontal components of the centrifugal forces to be balanced out, and the vertical components are additive. At 720 rpm (12 cycles per second) the unit has a maximum dynamic force of 7.5 tons.

Each shaft carries a number of removable eccentric weights attached with studs. This arrangement permits several different dynamic forces to be developed at any speed. A velocity pickup and accelerometer device is also mounted in the compactor between the rotating shafts to measure vertical displacement.

The shafts are driven by hydraulic-gear motors, with oil as the fluid. Power is supplied by a Chrysler gas industrial engine, driving 2 Vickers vane-type double pumps through a 2:1 reduction gear. At 1,200 rpm these pumps deliver 131 gpm and need 70 hp to drive them. Actual pressures developed during the testing of this first unit were only one-third the maximum, and the power required was correspondingly lower.

The vibrator unit is mounted on a steel sled in direct contact with the soil. Leading the compactor is a small sled which carries the engine, the pump, and the oil-storage tank. A separate enclosed trailer houses the extremely interesting oscillograph and other electronic apparatus which enable the scientists to measure the frequency and magnitude of vibration.

Tests Begun

The first field tests were designed to determine the resonant frequency of the vibrator-soil mass under various conditions of dynamic force and weight of the vibrator, and to compare these results with the theoretical predictions. To do this the vibrator was kept in one spot and operated through a range of speeds, while the dead weight of the oscillator and the number of eccentric weights were varied. The amplitude of the oscillations—both vertical and horizontal—the frequencies, resonant point, and the pipeline pressures were obtained by means of electronic recording equipment.

The results of these tests checked very closely with the theoretical predictions based on the tests with the smaller oscillator.

Actual field tests have been made to see how effective the machine is as a compactor. These tests were made by towing the machine along the beach and recording the densities of sand before and after the machine had passed. The values of density in pounds per cubic foot were converted into standard soil-measuring percentages based on the test in which a 1/30-cubic-foot cylinder is filled in three layers and each layer is compacted by 25 blows of a 10-pound hammer falling 18 inches.

"After 8 years experience, we know

CONSTANT research by Cedarapids Engineers to make an already good machine better is another reason why so many contractors stay sold on Cedarapids. Take the new Master Plant . . . newly engineered and improved to meet increasingly rigid bituminous pavement specifications with high capacities of accurately graded and uniform bituminous mixtures. All Cedarapids equipment, both Bituminous Mixing Plants and Crushing and Screening Plants, is engineered right up to the minute to *anticipate* your needs for the most modern profit-producing machines. Big volume output at low operating and maintenance cost is another bonus feature of Cedarapids equipment that makes Cedarapids first choice with so many contractors.

Shown below is Rockford Blacktop Construction Company's new Model MM, "Master Mixer" Unit, with Model MGC "Master Gradation Control" Unit (behind dust collector) operating at Forreston, Illinois. This set-up includes a Model 30-P Portable Charging Hopper Unit and Cedarapids Model 8828-C (88" x 28') Drier Unit, which Bill Howard especially likes for its high drying capacity, along with a Model 10XH-T Dust Collector Unit. At the left is shown the discharge end of the "Master Mixer" Unit.

"Our CEDARAPIDS MASTER PLANT is loaded with all these special features"

QUALITY CONTROLS continually police quality of material, make all mixes meet specifications.

LOW MAINTENANCE assures extremely economical operation.

HIGHLY PORTABLE for fast moving from job to job.

MIXING PADDLE FACES reversible . . . adjust out to compensate for wear . . . angularly adjustable to control thoroughness of mixing and speed for mix through mill.

ADJUSTABLE DISPLACEMENT POSITIVE TYPE PUMP with calibrated gauge and hand wheel control at operator's platform provides immediate and accurate pump output control.

JACKETED COMPONENTS including mixer, piping, pump, discharge box . . . for steam or hot oil heating.

DISCHARGE GATE power cylinder operated . . . steam or pneumatic.

RELIABLE BIN LEVEL INDICATING LIGHTS immediately show operator any bin compartment, or compartments, nearly empty.

PRACTICAL, POSITIVE FLOW CONTROLS automatically stop feeder, elevator and pump only, if feed of any size aggregate or mineral filler fails.

LIGHTS for cut-out switches on operator's panel immediately indicate feed that fails.

SELECTOR SWITCH for automatic or manual control of plant.

SYNCHRONIZED FEEDER with bitumen pump always gives correct proportion of bitumen to aggregate.

FULLY ENCLOSED PLANT keeps dust and heat loss to absolute minimum for better working conditions.

LARGEST CAPACITY MIXER with conservatively rated capacity of 100 to 150 tons per hour. Twin shaft type conforms to all existing specifications. Giant Single Shaft Mixer also available (optional) when conditions permit use, having advantage of vigorous, thorough and complete mixing of as much as 200 tons per hour and maintaining specified mixing time.

HORIZONTAL VIBRATING SCREEN on Gradation Control Unit assures accurate sizing of material.

FOUR COMPARTMENT BIN for Gradation Control Unit meets all specifications.

OVERFLOW CONVEYOR for Gradation Control Unit optional.

MINERAL FILLER ATTACHMENT for Gradation Control Unit with interlock optional.

EASY CALIBRATION designed for accurate, fast proportioning of aggregate and bitumen.

SAMPLING AND CALIBRATION equipment are engineered for checking conformance to specifications.

Gradation Control Unit can be replaced by Model TEF Transfer Elevator and Feeder Unit for production of single aggregate hot mixes. Bulkhead type aggregate Feeder is available for Model MM Mixing Unit to produce single aggregate cold mix.

Get complete details about all Cedarapids money making equipment from your Cedarapids distributor today.

THE IOWA LINE *of Material Handling Equipment Includes:* ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS • FEEDERS • PORTABLE POWER CONVEYORS • PORTABLE AND STATIONARY STONE, GRAVEL AND SAND PLANTS • REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • DRIERS • DUST COLLECTORS • HAMMERMILLS • WASHING PLANTS • VIBRATING SOIL COMPACTION UNITS • DOUBLE IMPELLER IMPACT BREAKERS

Under this test, 95 per cent density usually indicates satisfactory compaction.

Under actual tests, the CalTech vibrator produced densities of 95 and even close to 100 per cent to depths of 5 feet. The performance was especially remarkable because the sand contained only 3 per cent moisture, while 13 per cent is indicated for optimum compaction by standard laboratory methods. The density obtained in the field was actually about 100 per cent of the value obtainable in the laboratory at the same moisture.

Thus the machine definitely proved that it had solved the problem so far as sand and granular substances were concerned. And since sandy beaches are typical of many places where military engineers have to build, an important milestone has been reached. It should be re-emphasized, however, that new theoretical considerations still remain to be developed for use with other types of soils. The effects of cohesion, and the manner of variation of the modulus of elasticity of cohesive soil with depth, are two important variables affecting resonance and damping, about which little is known.

Oscillograph Shows Resonance

At the present time, electronic measuring equipment in the test trailer consists of gage testers, a brush recorder and amplifier, oscilloscope, vibration meter, and audio oscillator. As the vibrator speed picks up and approaches resonancy, the pattern on the oscilloscope changes. When the input patterns of the tamper and a measuring vibration meter merge, the pattern on the oscilloscope is a circle or ellipse. When and if the machine is produced commercially there will likely be some sort of visual device hooked to the machine or the engine compartment to permit the operator to obtain resonancy. From a practical point of view, however, operators soon learn resonant speeds anyway, by a sense of feel. There is little doubt what constitutes resonant speed to anyone who has stood around the machine.

While the machine is far from the commercial production stage, an important advance in the theory of soil compaction seems to have been made by CalTech for the Navy.

D. A. Houseman was Project Engineer on both Army and Navy contracts. Dr. George Housner, Dr. Adrian Pauw, and Dr. P. Quinlan contributed also to the theoretical development of the machine.

Pocket Dictionary of Architectural Terms

Practicing architects, as well as students of architecture, will welcome a handy little dictionary recently published by John Wiley & Sons, Inc., New York, N. Y. "Dictionary of Architecture", by Henry H. Saylor, measures 6½ x 4½ inches, is sturdily bound in cloth, and is printed in clear type—all of which makes for easy consultation on the job. Though it is primarily a dictionary of architectural terms, the author is aware that today's practice of architecture calls for a certain familiarity with engineering. However, in order to keep the book to reasonable proportions, he has included only such technical engineering terms as might, for instance, be used by a heating and ventilation engineer in discussing with an architect a project on which the two are collaborating; but not all the technical terms the same engineer would use in discussing the project with his own technicians are included.

All but the most seasoned architects are sure to appreciate the pronunciations given in parentheses after the less familiar words. The author explains that even if an American is irritated by being told how to pronounce a word he already knows, he should bear in mind that the lad from China or Peru, in the United States to study architecture, really needs a helping tongue. Quite, and so do some of us. We weren't too certain about "Arabotedesco", "mashrebeeyah", and "synecdoche".

"Dictionary of Architecture" is available from the publisher, John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. The price is $4.50.

Lightweight Panel

A new structural material produced by sandwiching a honeycomb-shaped impregnated paper filling between sheets of metal, wood, plastic, or asbestos cement is announced by Chrysler Corp., Detroit 31, Mich. The Cyclecore filler and exterior sheeting are permanently bonded by an adhesive.

Chrysler discloses that panels weighing 1.2 pounds per square foot give the same service as 12-inch-thick masonry weighing 144 pounds per square foot. Because considerably less weight is supported when exterior Cyclecore panels are used, the company explains, a 20 to 25 per cent saving is made in structural-steel framing. Weight reduction also makes possible savings of 15 to 20 per cent in roof beams and bar joists, and as much as 30 per cent in reinforcing steel for foundations. Fifteen per cent less steel is required in lintels and anchors, says Chrysler.

Cyclecore exterior panels are bonded by one of the more than 30 different Cycleweld cements and adhesives, which have been developed to join metal, wood, plastics, ceramics, or other materials. Cycleweld joint strengths have passed tension tests as high as 6,500 psi.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 592.

Viber Appoints Sales Mgr.

J. A. Robinson has been appointed Sales Manager for the Viber Co., Burbank, Calif. In this capacity he will work with distributors of Viber's high-frequency internal and external vibrators, with particular attention to the market east of the Mississippi.

Cedarapids

Built by IOWA

Bituminous Mixing Plants are real producers-!"

"... that's why we buy CEDARAPIDS," says BILL HOWARD

ROCKFORD BLACKTOP CONSTRUCTION COMPANY, ROCKFORD, ILLINOIS

"After eight years of operating our equipment under some mighty rigid specifications, we're completely sold on Cedarapids Bituminous Mixing Plants. They've got everything it takes to meet schedules on every job. Right now, we've got two Cedarapids Model ECW Batch-Type Plants, and we're also operating one of the new Cedarapids Master Continuous-Type Plants. That new Master Plant is really a honey! We can now supply specification mix from either of the Portable Batch-Type Plants or from the highly Portable Master Plant and easily move a plant to another job when necessary."

Bill Howard

ANOTHER Cedarapids PRODUCT

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U.S.A.

Heavy Grading Marks Highway Improvement

A Million Yards of Dirt Moved on 7.6-Mile Contract for Relocation of U. S. 40; Concrete Pavement 24 Feet Wide

C. & E. M. Photo

Fill is placed on U. S. 40 near one of the girder bridges. A D8 with a Carryall drops a load of dirt which is compacted by LeTourneau sheepsfoot rollers pulled by a D8. Disk harrows behind the rollers cut up any large chunks of dirt there may be.

• U. S. 40 across downstate Illinois was the scene of stepped-up construction activity last year as the Illinois Division of Highways continued its long-range improvement program for this busy traffic route. The longest and costliest stretch being rebuilt was the 7.6-mile portion in Clark County from the town of Marshall east to the Indiana state line. In this relocation the grading item alone totaled over a million cubic yards of earth excavation.

For simplification, the length was divided into two parts—a 4.2-mile (A-X) section at the west end, and a 3.4-mile (CD-X) section at the east end. Four large structures, two on each section, were built under a separate contract by the Culberson Construction Co. of Pana, Ill., for $305,028.80. Standard Paving Co. of Chicago was awarded the roadway work on both sections for a contract price of $1,346,386.83. The total project thus cost $1,651,415.63.

Standard Paving sublet all items, except the concrete pavement and Class X concrete for drainage structures, to S. J. Groves & Son of Minneapolis, Minn. Right-of-way clearing got under way in March, 1951, followed right along by the structure and culvert work. Dirtwork started in May, and was far enough advanced by late September for paving operations to begin. Grading was 90 per cent completed in November, along with the structures, but by the middle of November unusually early snows and cold prevented any further construction, with only about 40 per cent of the paving completed and no finishing done.

Modern Highway

As the entire project is a relocation, no use was made of the existing road, which was built back in 1919 with a 20-foot concrete pavement; twelve years later it was surfaced with brick. Constructed directly over the subgrade at that time, the pavement had cracked and deteriorated badly, and was in poor shape for the heavy traffic that this route carries. The relocation roughly parallels the old road, either north of it or to the south. For the present, portions of the original pavement will be left in place for the private use of property owners abutting the right-of-way, and will provide access to the new highway.

Concrete pavement on the relocation is 24 feet wide x 10 inches thick and is reinforced with steel-mesh fabric. It has a 1½-inch center crown, and is flanked on each side by 10-foot shoulders that have a total pitch of 7½ inches. Sideslopes vary, but are generally 4 to 1. In cuts the slopes go down to a ditch that is 3 feet deep x 2 feet wide; backslopes are 3 to 1.

The pavement is laid on a 6-inch base of granular borrow that extends one foot beyond the pavement on each side, or with a total width of 26 feet.

Major Structures

Going from west to east with the stationing, the four major structures built by the Culberson Construction Co. are as follows:

1. A continuous steel I-beam span bridge with a reinforced-concrete deck, over Big Creek. It has three spans, 55 feet 10 inches, 69 feet 10 inches, and 55 feet 10 inches; and a 30-foot roadway with a 2-foot safety walk on each side.

2. A triple-box reinforced-concrete culvert, 212 feet 10 inches long, carrying Little Creek under the highway fill. The boxes are 9 feet wide x 12 feet high, inside dimensions, and the structure is on a 20-degree skew.

3. A reinforced-concrete-deck girder bridge with a 44-foot 8-inch span on a 14-degree skew; the roadway is 44 feet.

4. A reinforced-concrete-deck girder bridge with a 40-foot span and a 44-foot roadway.

With the exception of the long culvert, the structures were built to accommodate only this new roadway. At the culvert location the new road crosses the old at a flat angle, and a detour was built over the fill at this point to keep traffic moving over the original highway while the new con-

• loads trucks
• hugs curbs
• dodges poles
• makes vertical set-ins
• undercuts sidewalks

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Flexibility is further increased because shiftable boom cuts within 11" of side obstructions . . . digs as efficiently behind either crawler as it does in center position. Spoil conveyor shifts completely through machine by power in less than 1 min. to dodge poles and buildings without swerving from grade line . . . belt direction is instantly reversible to dump right or left. Arc of conveyor gives low-level, close-to-trench deposit . . . or reaches up to 6'-8" (8'-8" with extension section) for loading into trucks. Discharge height remains constant, regardless of digging boom position.

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PARSONS Trenchliners

PARSONS COMPANY, NEWTON, IOWA (Koehring Subsidiary)

struction was in progress. An existing culvert under the old road, and just north of the relocation at this point, was removed. It consisted of a double 10 x 10-foot RC box, 52 feet long. The new culvert was designed to extend southward beyond the fill in case another roadway is added at some future time, converting this portion of U. S. 40 into a dual highway. Right-of-way has been acquired for this possible improvement.

Grading

In excavating the 1,036,956 cubic yards (estimated) of earth, there were nine balance points distributed over the 7.6-mile job. One balance area, containing 451,614 yards or nearly half the dirtwork in the item, was 6,800 feet in length. Haul distances stretched out to 10,000 feet in some locations. In one section near the east end of the project, the contractor bought a borrow pit in order to eliminate some long hauls.

Dirt consisted chiefly of clay and glacial till, or hardpan, and was usually rather wet when taken out of the cuts. The small rock-excavation item of 8,300 yards overran to about 60,000 yards before the job was finished, and most of it was encountered in the western end of the job. The formation was mostly limestone, and in big boulder shapes that were hard to handle.

Not expecting to run into much rock, the contractor did not move in any heavy drilling equipment such as wagon drills, and so made his blast holes with jackhammers using 4, 6 and 8-foot lengths of drill steel. Holes were charged with Gold Medal 40 per cent dynamite, and after the blasts a pair of LeTourneau Rooters pulled by Caterpillar D8 tractors ripped through the rock beds, leaving the rubble in pieces small enough to be easily picked up and hauled away.

C. & E. M. Photo

South end of the 212-foot 10-inch-long RC culvert which carried Little Creek under U. S. 40. The 10-foot separation between the west wing wall and the barrel resulting from a slide can be seen at the left of the picture.

Equipment

Rock was handled by a fleet of seven Tournapulls, C Roadster models, pulling 12-yard Carryalls, which were also used for the long hauls. On the shorter hauls, S. J. Groves used five LeTourneau 12-yard LP Carryalls, five LeTourneau 20-yard W Carryalls, and one Caterpillar 18-yard 80 scraper. For tractors he employed Caterpillars—21 D8's and one D7. They were hooked to the scrapers, served as pushers in loading the equipment, dozed the fills, or pulled the rollers in compacting the material.

Fills were put down in 6-inch lifts, and compacted to at least 90 per cent of maximum density with LeTourneau tamping rollers. Compaction actually averaged out to between 92 and 98 per cent of maximum density. Rollers were hooked up in either triple or dual-drum combinations, and six such units were on hand. Since the material was usually on the wet side, the rollers pulled disk harrows behind them to aerate the dirt and cut up any large chunks in the interests of better compaction.

Maximum cut and fill on the job were 38 and 50 feet respectively. The contractor divided his equipment into three sparate grading outfits in order to spread out the work over the whole job. Together they moved an average of 10,000 yards of material in a 10-hour work day. Equipment was serviced once a day with D-X Mid Continent fuel supplied by tank trucks from stations in West Union, Ill., which is about 10 miles south of Marshall.

Granular Borrow

The 29,600 cubic yards of granular borrow for the 6-inch base course under the pavement came from a single gravel pit requiring a maximum haul of 7¼ miles to the job. A Northwest 1¼-yard Model 6 shovel worked the pit, and loaded the material into a fleet of six to eight Ford trucks carrying 5 yards a trip. It was spread over the subgrade in a single lift by a pair of Caterpillar No. 12 motor graders, and compacted by rubber-tire rollers.

Standard Paving Co. set up a concrete batch plant in West Terre Haute, Ind., on a siding of the Pennsylvania Railroad. This involved a 7-mile dead haul to the east end of the job, but no other siding was available closer to the work. Dry batches were hauled from the plant to a new Rex 34-E dual-drum paver that laid the concrete in a full 24-foot lane.

Before any concrete was laid on the new road, a temporary detour or crossover was provided in the vicinity of the long culvert near Livingston. This permitted traffic using the existing road to cross the new location. The 2,300-foot detour consisted of a 22-foot-wide x 7-inch transition 350 feet long on the west end; then 1,400 feet of the new 24-foot x 10-inch pavement temporarily used as a detour; and then, connecting to the old road again at the east end of the detour, 600 feet of 10-

(Continued on next page)

With boom in offset position, 250 trenching digs close to curb . . . reversible, power-shift spoil conveyor dodges utility poles without interrupting production. Operator has full vision front and rear for safety.

7-SECOND DISCHARGE with Kwik-Mix 11-S

Saving important seconds on every batch of concrete, tilted Flow-Line Discharge Chute pours full 12.1 cu. ft. batch in 7 seconds. Kwik-Mix 11-S Dandie® also has side or end discharge, 2 or 4 wheels, and special tower attachment. Other sizes: 3½-S to 16-S. Also check Kwik-Mix bituminous, tilt and non-tilt plaster-mortar mixers . . . and Moto-Bug® (power wheelbarrow) shown here. Ask your Kwik-Mix distributor for all facts.

KWIK-MIX (Koehring Subsidiary)
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2, 3 or 4-material Johnson "Hi-Speed" Batchers

. . . are "Hi-Speed" because extra wide, 15"x36", fill valves and wide bin top openings reduce charging time . . . steep side slopes give fast, clean discharge. Standard batcher handles 34-E paver batch. For charging truck mixers, 4 material "Hi-Speed" Batcher can be furnished with 2, 3 or 4-yd. weigh hoppers having double clam discharge gate and collector ring. Also check the complete Johnson line of mix plants, bins, buckets and silos.

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½-yd. . . . 10-ton Heavy-Duty Koehring

Versatile Koehring 205 with ½-yard shovel or hoe readily converts to clamshell, dragline or lift crane . . . lifts 7¾ to 10 tons, depending on crawler or rubber tire mounting. All main clutches are self-adjusting, have heat-compensator springs that make tension changes automatically . . . maintain full clutch efficiency at all times. Other Koehring heavy duty sizes to 2½-yds. dipper capacities . . . 79½ ton lift capacities.

KOEHRING COMPANY
Milwaukee 16, Wis.

X63-REV

Heavy Grading Marks Highway Improvement

(*Continued from preceding page*)

inch - thick crushed - stone surface course 22 feet wide. After this detour was completed, paving started at the Indiana state line at the east end of the job and proceeded westerly to the other end.

Slides Cause Trouble

Progress was delayed somewhat by earth slides in the fill over the culvert at the site of the detour. Little Creek at this point flows through a narrow valley hemmed in by sharp ridges rising on both sides. The flow of water is to the south. The upper stratum of material in the valley contains about 97 per cent clay, with a high liquid limit of 49 per cent that gives the ground a consistency comparable to that of toothpaste.

In view of this subsoil condition, the triple 9 x 12-foot box culvert was designed with a foundation of 300 timber piles. These piles, 34 to 36 feet long, were driven to 20-ton bearing with at least a 2-foot penetration into a layer of gravel that underlies the soupy clay. The reinforced-concrete structure has 12-inch walls and 18-inch roof and floor slabs, with the piles projecting 3 inches into the floor slab.

Despite this heavy construction, failure developed in the culvert when the ground began sliding. A semicircular crack was first noticed at the top of the 24-foot fill that had been placed over the culvert. As this crack widened, the construction joint between the southwest wing wall and the west wall of the culvert began opening up. The wing wall is 22 feet long with a cantilever-type footing supported on 12 piles spaced on 3-foot 3-inch centers.

C. & E. M. Photo

This view along the culvert wing wall shows the effect of the slide.

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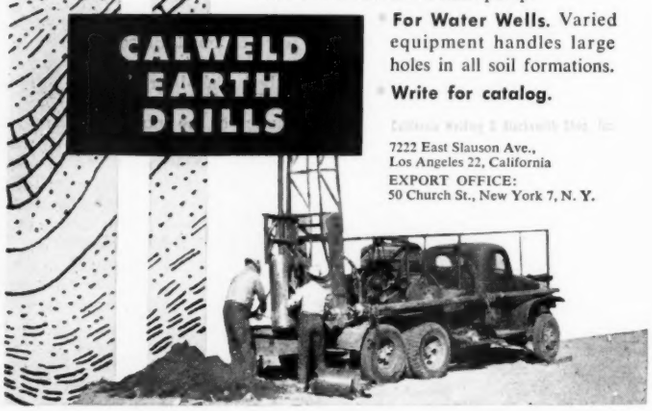

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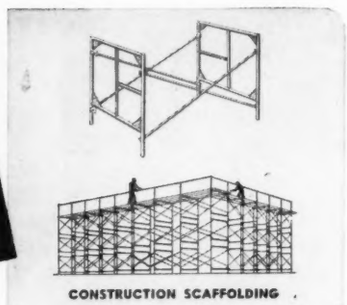

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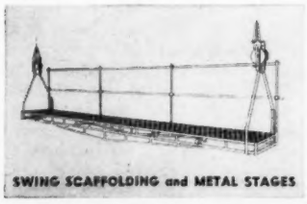

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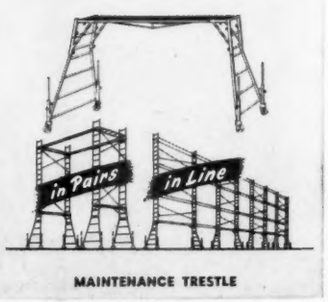

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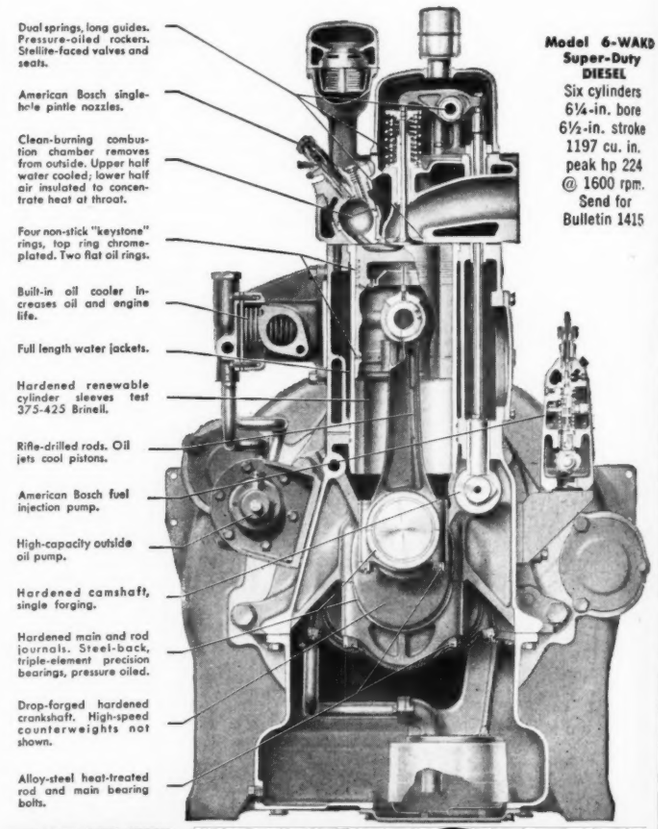
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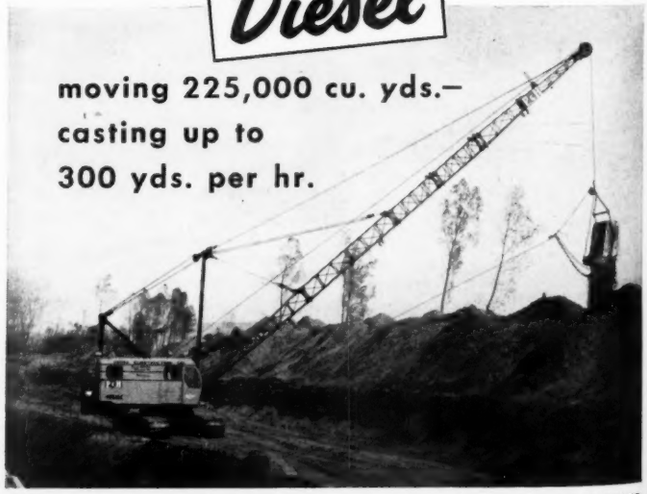

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS., NEW YORK, TULSA, LOS ANGELES

C. & E. M. Photo
Frank Grossbaier, Powder Foreman (left), William D. Woolley, Resident Engineer, and Superintendent Cecil B. Seals pause from their labors.

The opening widened rapidly, and the entire wall moved east until it was separated from the barrel of the culvert by 10 feet. Movement also took place to a lesser degree at the southeast wing wall where the construction joint opened up about 11 inches. Within the culvert near the south end a 3-foot bend occurred, throwing the barrels out of line.

Only the southerly 136 feet of the 212-foot 10-inch culvert had been constructed when the failure was noted. The remaining 76 feet was not scheduled for completion until after the detour was in operation. Timber shoring was built up within the box to hold back the fill where the bend had occurred.

The general consensus was that slippage in the plastic material was caused by horizontal rather than vertical forces, and consulting geologists recommended that the sideslopes be flattened and a surcharge be built up out beyond the present fill limits. They also suggested lowering the grade over the culvert.

To carry out these recommendations, the sideslopes were flattened from 2 to 1 to 6 to 1, and the grade was lowered by cutting 8 feet off the 24-foot fill over the culvert. The surplus material made up the surcharge placed over the fill slopes. To lower the grade, the vertical profile west of the culvert was sharpened from 3 per cent to 3.6 per cent. But by shifting the PI of the vertical curve slightly to the west, the grade east of the culvert was held at 3 per cent, as originally designed.

Quantities and Personnel

Major items in the 7.6-mile highway relocation contract included the following:

Earth excavation	1,036,956 cu. yds.
Rock excavation	30,000 cu. yds.
Granular borrow	29,600 cu. yds.
Cement-concrete pavement, 10-inch	108,597 sq. yds.
Pavement fabric	108,597 sq. yds.
Class X concrete	1,084 cu. yds.
Reinforcing bars	138,580 lbs.
Pipe culvert, 15 to 72-inch	5,110 lin. ft.

S. J. Groves & Son employed an average force of 40 on the grading portion of the work under the direction of A. J. McKay, Superintendent, and Cecil B. Seals, General Foreman.

For the Illinois Department of Public Works and Buildings, Division of Highways, William D. Woolley was Resident Engineer. The project was under the direct supervision of N. E. Sprague, District Engineer of District 5, with headquarters at Paris. The Department is headed by Charles P. Casey, Director, with F. N. Barker, Chief Highway Engineer, and R. H. Tittle, Engineer of Construction.

Improved Grease Gun

An improved grease gun has been brought out by National Sales, Inc., 812 N. Main St., Wichita 5, Kans. The one-man-operated Gre-Zer-Ator fits on the refiner's original container. The company claims that a new booster makes it possible to produce a greater volume of grease per stroke of the pressure-valve handle, without air or electrical connections. The hydraulic booster develops up to 7,000-pound pressure.

The improved gun is of all-steel construction in a black oxide and zinolyte finish, with a brilliant red-orange steel cover assembly.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 575.

New Booklet on Floor Lath

A booklet on floor lath for steel and concrete joist construction is announced by Pittsburgh Steel Products Co., P. O. Box 118, Pittsburgh 30, Pa. It illustrates how Steeltex is applied, gives complete specifications, and lists test data and design formulas.

Steeltex consists of a 3 x 4-inch welded mesh of 12-gage wire on a waterproofed backing. This backing makes a form for the concrete and permits proper curing. The lath is unrolled across the joists from the outer or bearing walls. It is clipped to the end and intermediate joists.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 601.

The Surveyor's Notebook

Reporting on Unusual Surveying Problems and Their Solutions

Notekeeper: W. & L.E. Gurley, America's Oldest Engineering Instrument Maker

"...And Remember the Red River Valley"

"Reading in 'The Surveyor's Notebook' collection* about Arthur Kidder and Joe Thoma's cadastral surveys reminds me of the time I worked with them on the Oklahoma-Texas boundary dispute," says Wesson Cook, Planning Engineer, The Maryland-National Capital Park and Planning Commission.

"It was 1926. Under decree from the U. S. Supreme Court, our General Land Office party was assigned the job of re-establishing the boundary line at points where the Red River had changed its course—causing considerable dispute over locations of valuable oil lands.

"Along one 100-mile stretch, the old boundary was often submerged under shallow 'oxbow lakes' formed by the change in the Red River channel. It was impossible to mark the boundary or set up tripods.

"Here's how we got stations: We drove posts into the muck, then took the head off an old tripod and attached it to an iron bracket which slid down over the posts, and was fastened with clamp screws. With a triangular platform of heavy boards, we were able to walk around the stations without disturbing the transit.

1926 snapshot shows Cook leveling transit set up on boundary post in Red River.

"One day, when we were working under considerable pressure, I lost the crosshairs of my transit. The work *had* to go on and I was afraid I was sunk. The only thing to do was to catch a spider and have it spin new crosshairs.

"We hunted for one; and, after finding a nice specimen, kept the little devil warm under glass until it had spun enough to help me. The biggest part of the job was getting the web in place. After spending the good part of an afternoon at the tedious job, I had crosshairs again. The work went on.

"This, of course, was before the days of glass reticles, and would never happen today with a Gurley Transit. I've used just about every make; and I'd say it's going to be pretty hard to beat a Gurley for accuracy and ease of adjustment."

At Calvert Mansion, Riverdale, Md., HQ of Maryland-National Capital Park and Planning Commission, Wesson Cook sights through a new Gurley.

***Kidder and Thoma's** account of cadastral surveying with a solar transit, Thoma's remedy for "frozen" tripods and all other stories and surveying tips from the first year's *"Surveyor's Notebook"* series have been gathered into permanent booklet form. Write for your free copy of *"The Surveyor's Notebook."* You'll find it very helpful.

When writing for your bound copy of "The Surveyor's Notebook" stories, ask also for Bulletin 50. It gives full details on Gurley instruments.

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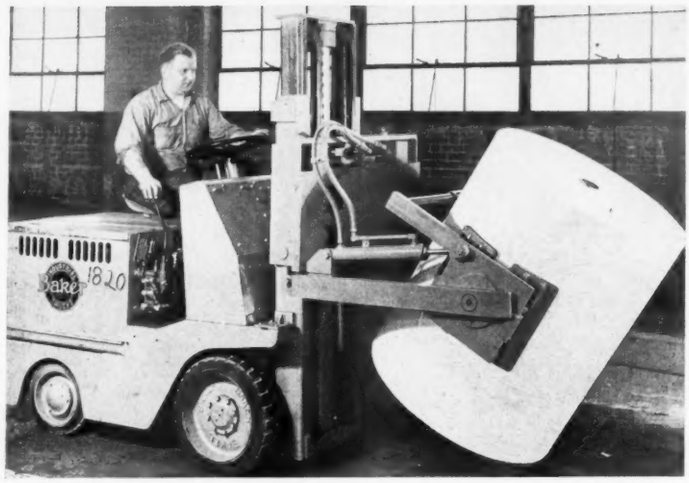
Fork-Truck Clamp

A roll clamp attachment for fork trucks has been developed by The Baker-Raulang Co., Baker Industrial Truck Division, 1230 W. 80th St., Cleveland 2, Ohio. It is designed to pick up and haul drums, large pipe, or any other cylindrical material from 1½ to 3 feet in diameter. It rotates 90 degrees in a vertical plane so loads may be stacked either vertically or horizontally. Clamping pressure is controlled by an adjustable relief valve in the hydraulic system.

The clamp is installed on Baker's four-purpose carriage, which combines the features of fork-spacing, side-shifting, clamping, and standard fork use. According to the company, the clamp detaches in two minutes. Two men can remove the retaining pins at the base of the truck carriage, detaching two push-pull Hansen couplings on the clamp's hydraulic line and lifting the clamp off the carriage. Next, a set of forks is installed and locked by the retaining pins—and the truck is ready for pallet loads. With the clamp removed, the truck operator is able to use the side-shifter to get in close to columns and walls with his pallet loads. The new attachment is available for any Baker fork truck from 1,000 to 4,000-pound capacity.



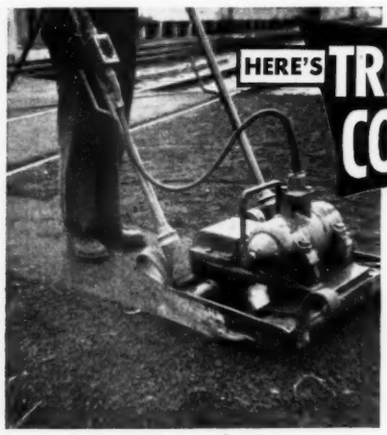
This roll clamp for Baker fork trucks handles any cylindrical material from 1½ to 3 feet in diameter. It rotates 90 degrees in a vertical plane, permitting loads to be stacked either vertically or horizontally.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 607.

Cylinder Lubrication

The fundamentals of correct cylinder lubrication are covered in a booklet issued by Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y. It describes how the lubricant does its work, and what should be considered in selecting and applying an oil for the correct lubrication of all types of cylinders. Colorful flow diagrams show how oil solves the problem.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 566.



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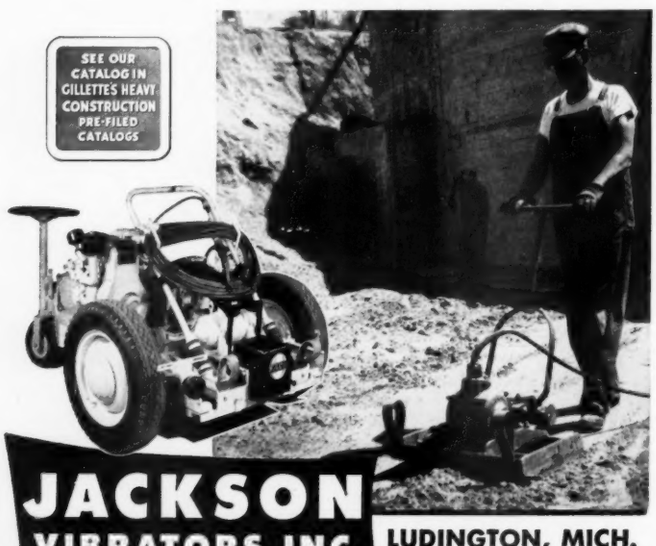
SEE OUR CATALOG IN GILLETTE'S HEAVY CONSTRUCTION PRE-FILED CATALOGS



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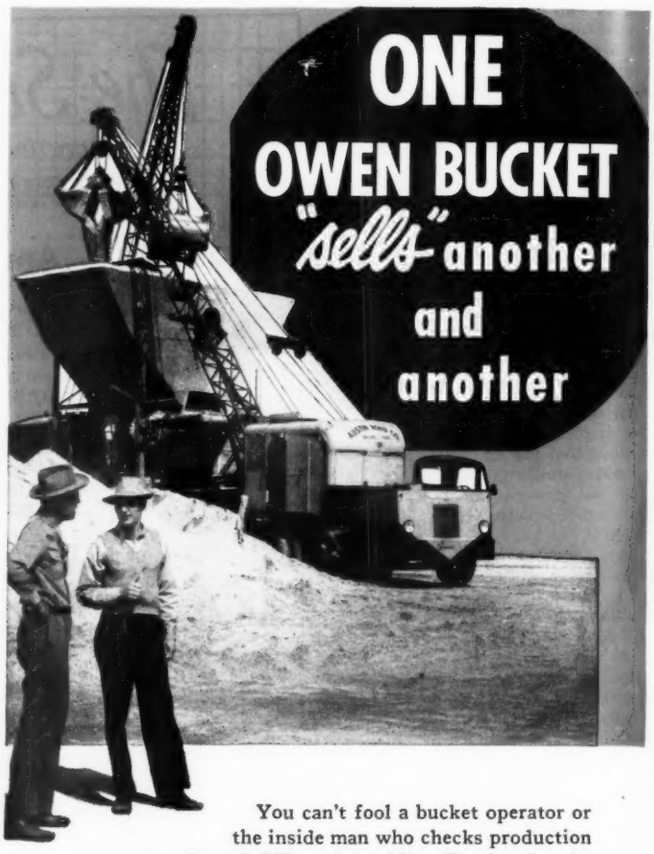

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Planning to Unsnarl That Highway Muddle

Administrative Action a Solution, Ohio Highway Department Director Tells Purdue Road School

• WHILE automotive engineers are producing more and better cars and trucks at an ever-increasing rate, highway engineers are thinking about the roads along which these vehicles must travel. This problem, with its attendant headaches, was an important subject of discussion at the Thirty-Eighth Annual Road School at Purdue University last April. T. J. Kauer, then Director of the Ohio Department of Highways, read a paper in which he explained how his Department was meeting the challenge. The procedure adopted in Ohio, he thought, might well prove helpful to highway departments in other states.

Inadequate financing, while it lies at the root of the trouble, is not everything, Mr. Kauer believes. The development of highway organizations and the adoption of administrative procedures adequate to present-day needs must be carefully considered. As far as the situation in Ohio is concerned, Mr. Kauer divides its solution into two main phases—(1) operational procedures that can be undertaken at once within the framework of existing statutes, and (2) procedures that can be adopted only after future legislative action has been taken.

Engineer-in-Training Program

The most important step the Ohio Department has taken in the first phase is to adopt an engineer-in-training program. This program is designed to attract new engineering graduates to fill existing vacancies and give them a well-rounded background of experience in the Department's activities. Even after the engineering staff is built up to full strength, it is proposed to continue this program, so as to furnish an estimated total of 80 new graduate replacements a year.

The training program got under way in 1949, when a trained supervisor set about contacting various colleges and universities for student recruits. In the first year the supervisor visited 16 engineering schools in different parts of the country and got 300 applications, which resulted in the final enrollment in the highway training program of 98 engineers upon their graduation.

Before actually contacting possible recruits, the Department gave careful consideration to its policy, and members came to the conclusion that, while adequate starting salaries were important, they were not everything. Potential employees are often greatly concerned as to whether their partisan political affiliations will make any difference to their being hired; and with a view to clarifying this point, the Department declared publicly that the purpose of the training program is to attract engineering graduates without any reference whatsoever to their political views. This plan has paid off; no political question has ever been raised, and plenty of recruits have been forthcoming.

The starting salary was first fixed at $276 a month, but two subsequent increases raised it to its present level of $315 a month. Successful applicants are appointed as Engineer Aides IV and receive an increase of $15 a month for each year of satisfactory performance of duty for a period of four years. (All salaries are subject to a 5 per cent variation every two years in conformity with each 12-point change in the Bureau of Labor Statistics cost-of-living index.) After the trainee has completed his course of highway training and has been registered as a professional engineer, he is eligible for an appointment in the appropriate grade of civil engineer and becomes a full-fledged engineer and a member of the Department.

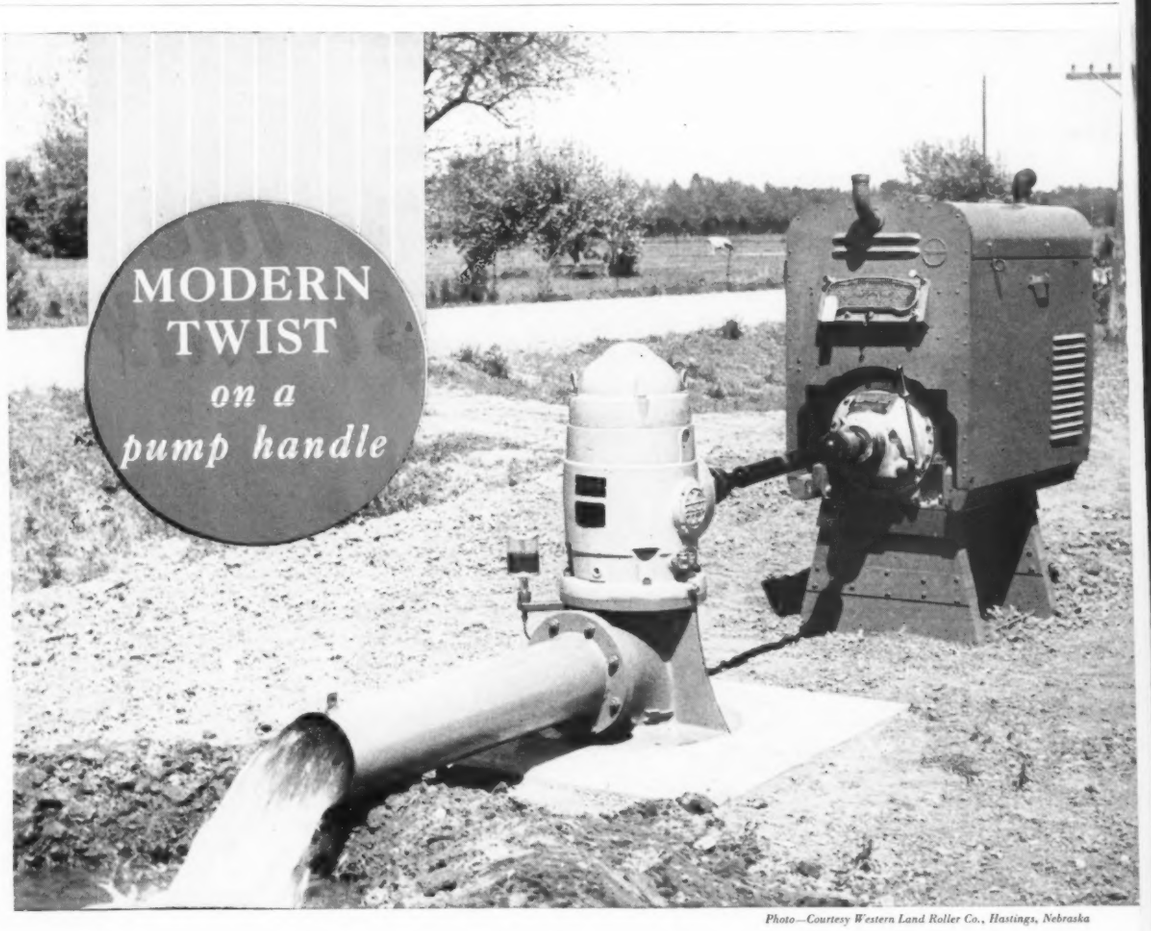
As a sidelight on this program, Mr. Kauer commented that it has to date recruited 345 engineers-in-training from 46 different engineering schools, of whom only 101 have severed connection with the Department, giving a turnover of 29.3 per cent. Taking into consideration that defense production has caused an abnormal turnover of 37.8 per cent of the 9,000 personnel of the Ohio State Highway Department as a whole, the training program's comparatively lower turnover is an indication of its success.

Planning Bureau Formed

In addition to the engineer shortage, Mr. Kauer explained how his Department was dealing with another problem in the category of operational procedures to be undertaken at once under existing statutes. This problem took the form of bottlenecks which had developed in the preparation of detailed plans for construction. The following is what had happened and how the Department faced up to it.

A good many years ago in Ohio, all preparation of construction plans, awarding of contracts, and so on was centered in the State's Bureau of Construction, to which was subsequently added a Bureau of Location and Design to relieve the Construction Bureau of all duties other than actual supervision of construction operations. As time went on, however, this Bureau of Location and Design became overloaded with work, due to normal growth and

(*Concluded on next page*)



Photo—Courtesy Western Land Roller Co., Hastings, Nebraska

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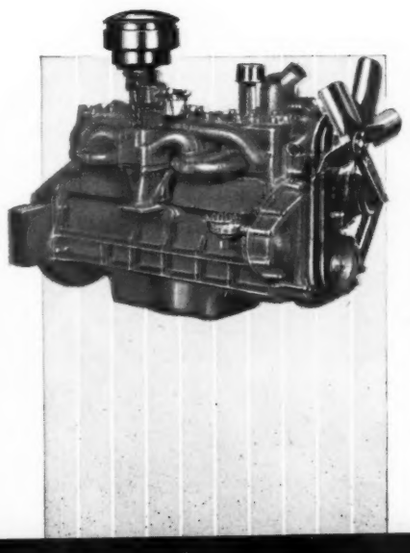

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Planning to Unsnarl That Highway Muddle

(Continued from preceding page)

expansion of the Department's activities. To alleviate this, in 1949 the Department created, by administrative action, a Bureau of Planning and Programing. The purpose of the new Bureau was to provide for the orderly planning, programing, and financing of state and Federal highway-system improvements, together with the programing and financing of advanced engineering studies.

For all highway improvements under the Department's jurisdiction, the Bureau of Planning and Programing enters into negotiations and agreements with other political subdivisions, as well as with the Bureau of Public Roads. Another of its functions has been to give extensive study to a system of sufficiency ratings which it is hoped the Department will adopt for Ohio's highways.

Has the establishment of this Bureau of Planning and Programing been a success? Mr. Kauer is convinced that it has. As evidence he cited the fact that, whereas in 1949 the Department was faced with an acute shortage of construction plans, it is now anticipating a sizable backlog of completed plans by the end of this year. This all makes for flexibility in the adoption of construction programs.

Recommended Legislation

Mr. Kauer next turned to the second of his two general phases for Ohio's highway organization—procedures that can be adopted only after future legislative action has been taken to revise existing statutes or, if necessary, enact new laws. The Department set up an interim committee to make an inclusive state-wide engineering study of needs, together with a fiscal study. The recommendations made by this committee are now being reconsidered, and it is hoped that early next year it will be possible to present final recommendations to the regular session of the State Legislature. The major recommendations so far may be summarized as follows:

1. Reorganization of the Department's executives to include a Director of Highways (appointed by the Governor); an Assistant Director (appointed by the Director); and four Deputy Directors (appointed by the Director) to handle planning and programing, design and construction, operations, and administration.
2. All other personnel to be placed under the civil service.
3. The Director of Highways to have legal authorization to make contracts with engineering firms.
4. The establishment of a Division of State-Local Relations.
5. Field divisions and maintenance districts to be consolidated regardless of political subdivision boundaries.
6. Adoption of a uniform accounting and expenditure-reporting system.
7. The cities to consolidate street-management functions into a single agency; the villages and small cities to be authorized to make contracts with the counties, when necessary, for street maintenance; and local rural-road construction and maintenance to be consolidated under the counties, with the townships retaining fiscal control over those roads under their jurisdiction.

Mr. Kauer concluded his paper with a reaffirmation of his belief that the challenge facing highway engineers today can be met by administrative action. He emphasized, however, the necessity for new legislation to speed up the modernization of highway organization. This is the only way, he believes, that the present traffic congestion can be overcome.

Good Safety Record for Pike

The safety record of the New Jersey Turnpike for the first six months of 195 was far better than on New Jersey's o the nation's highway system, despi traffic volumes hitting new peak monthly.

"For the first six months of this yea accidents on the Turnpike totaled 3 which, using the standard formula the Federal and state governments equaled 90.7 per 100,000,000 miles travel," said the Turnpike Authority "This figure of 90.7 compares with 4 on the same mileage basis, on Ne Jersey's highway system for all of 195 the latest figure available. From th standpoint of fatalities, the Turnpike record in the first six months equale 4.1 per 100,000,000 miles of travel agains 4.4 for the state's public highways an 7.7 for the national highway system f all of 1951."

Each accident on the Turnpike re ceives the personal attention of th commissioners, who are making studie to determine how to prevent recur rences and provide the safest high way ever constructed. In June there were 50 accidents, less than in earlie months but, similarly, caused by human and mechanical failures. These failure were predominantly unlawful speeding driving too close behind vehicles, inat tention to driving, and improper passing and parking—none of them attributable to the design or construction of the Turnpike.

Said the Authority, "We plan to use every possible means to see that the regulations of our Turnpike are fully enforced in order to minimize accidents and to safeguard our patrons."

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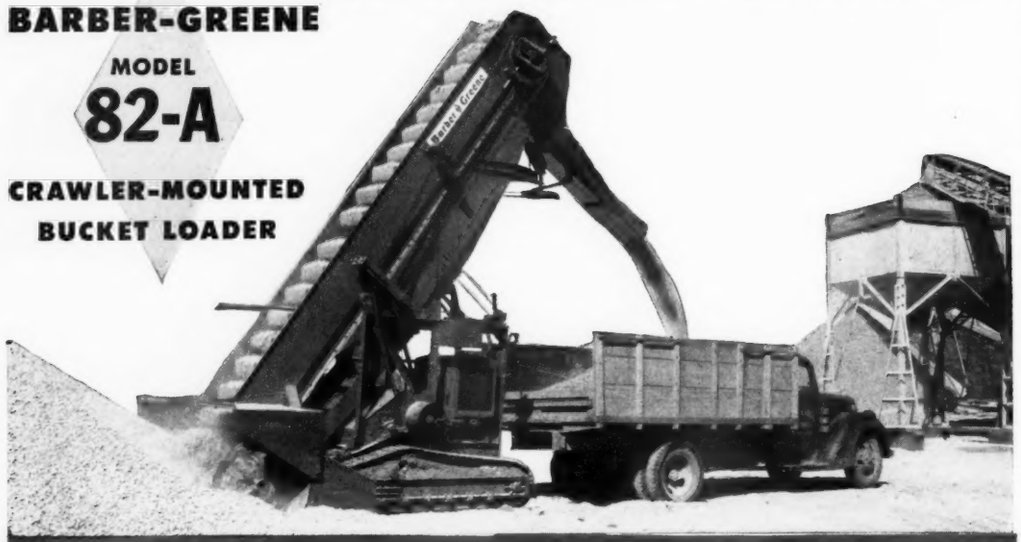

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Model 750 is instantly self-priming, will deliver approximately 15 gpm at 600 rpm, and has a pressure range from 0 to 350 psi. The case and rotor feature tough, resilient Nylon rollers for positive liquid displacement. The ball bearings and stainless-steel shaft are permanently lubricated.

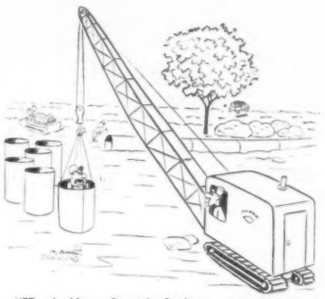
The pump has ¾-inch pipe connections and mounts directly on the power-takeoff shaft. It can also be furnished with base plates and solid shaft for gas-engine belt and pulley drive. For power-takeoff use, sleeves and hub adapters are available in various shaft sizes; a shear pin in the adapter hub protects pump and shaft. Pump weight is only 11 pounds.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 552.

From Black Powder to Nylon: Du Pont's 150th Anniversary

The 150 years since Eleuthere Irenee du Pont de Nemours brought his black-powder (gunpowder) industry from France and founded a factory on Brandywine Creek near Wilmington, Del., have what it takes to make a success story.

Last July, E. I. du Pont de Nemours & Co., Inc., celebrated its 1½-century mark by the publication of a book, "Du Pont—The Autobiography of an American Enterprise", and by some colorful ceremonies at Brandywine Creek and at various Du Pont plants and offices across the nation. The ceremony at Wilmington included a historical dramatic prologue on the story of the founder and his wife, followed by speeches and music. The book, in tracing Du Pont's development, shows how this has paralleled the expanding needs of the nation from 1802 until the present day. Not only has Du Pont's chemical and textile research resulted today in a family of some 1,200 products and product lines and an operating investment of about $1½ billion, but the company has built one atomic-energy plant for the Government and is building another for the Atomic Energy Commission, each at a fee of one dollar.



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Type and condition of material to be loaded.
Capacity of hauling unit.
Skill of the operator.
HAUL
Performance ability of hauling unit.
Hauling distance.
Haul road condition.
Grades.
Miscellaneous conditions affecting haul speed.
DUMP
Destination of material.
Type and maneuverability of hauling unit.
Type and condition of material.
RETURN
Performance ability of hauling unit.
Return distance.
Haul road condition.
Grades.
Miscellaneous conditions affecting return speed.
SPOT
Maneuverability of hauling unit.
Type of loading machine.
Location of loading equipment.
2
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Bridge Spans Tagus in Portugal

Riverbed Too Soft to Hold Falsework, So Service Span Floated In for Erection of Five Arch Spans

By J. GRINDROD, B. A. (Com.)

(*Photo on page 1*)

• A NEW bridge, now the largest in Portugal and ranking among the major bridges on the continent of Europe, was completed over the River Tagus, near Vila Franca de Xira, at the end of last year. It was officially opened on Sunday, December 30, 1951.

At an approximate cost of 120,000,000 Portuguese escudos, the bridge was built by Dorman, Long & Co., Ltd., of Middlesborough, England, in association with the Portuguese firm SETH (Sociedade de Empreitadas e Trabalhos Hidraulicos). Dorman, Long & Co., Ltd., was responsible for the steel superstructure, while SETH was the contractor for the substructure and approaches. Working in close collaboration with SETH were two Danish firms, Hojgaard & Schultz, A S, and Kampmann, Kierulff & Saxild, A S, both of Copenhagen, and both specialists in difficult marine and foundation work. The contract allowed 1,000 days for construction of the bridge.

Access to Portugal

Situated on the promontory created by the wide estuary of the Tagus and the Atlantic, Lisbon has always been difficult of access from both the south and east. Hitherto there has been a ferry at Vila Franca de Xira, but the nearest crossing of the Tagus by bridge was at Santarem, 80 kilometers upstream from Lisbon. The need for a bridge farther down the river to improve road communications, especially into and out of Lisbon, was long recognized, but many difficulties prevented such construction from being carried through. At and above Lisbon for some 30 kilometers the Tagus estuary widens into a large sheet of water, at places over 10 kilometers wide; where it narrows to a reasonable width, its bed consists of soft silt as much as 30 meters below water level; then, too, the river is subject to tidal currents, and strong winds often blow through the valley. For these reasons previous schemes had ultimately been abandoned.

Vila Franca de Xira was the first place at which a bridge was at all possible. Though there is a tidal range as great as 4 meters there, the river at least narrows to about 500 meters. Moreover, there is a layer of sand and gravel at about 30 meters below mean water level that provides sufficient bearing for pile foundations. It was at this point, therefore, that in 1947 the Portuguese Government proposed to have a bridge built, and invited tenders, through the National Road Board, for a suspension-type bridge with a central span of 850 feet. Alternatively, firms tendering were allowed to submit their own designs.

Dorman, Long & Co., Ltd. Photos

Normal falsework was out of the question for erecting the arch spans, so this service span was floated to each opening in turn.

With the service span supported at the base of each pier shaft, permanent steelwork was assembled on top of it.

Design

The official suspension design proved far too costly. That adopted by the National Road Board in April, 1948, was the first of two alternative designs submitted by the three cooperating contractors. This design incorporated five riveted-steel spans of 102.5 meters each between supports for the river crossing, the spans consisting of tied arches stiffened by means of plate girders below the bridge deck. Piers supporting the bridge and approach viaducts were to be of reinforced concrete.

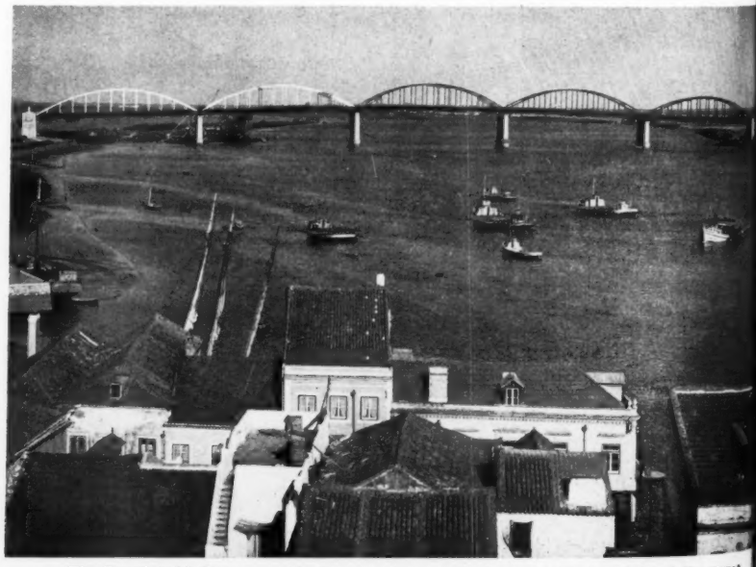
The over-all length of the structure is 1,224 meters, while the total length of the approach spans is 704 meters and of the river spans 520 meters.

Clearance of the spans above high water level is approximately 20 meters; water depth at mean water level is 13.5 meters; top of the arch above mean water level, 40 meters. The bridge carries a roadway 9 meters wide, designed for heavy highway traffic, and two sidewalks of 1.5 meters each. The bridge approaches consist of earth-filled embankments, followed by reinforced-concrete viaducts made up of continuous beams arranged in groups of three bays with spans of 20, 25, and 20 meters.

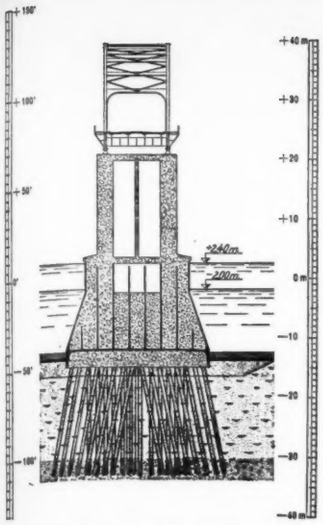
Substructure

Precast RC piles up to 35 meters in length were used to carry the foundations of the approaches, and these were made in two parts: a solid bottom part 25 meters long, 45 centimeters in diameter; and a top part cast in place

Here, behind a sardine boat, is one of the arch spans. Notice the plate-girder stiffening below the bridge deck. At right is the service span, in place for more erection.



The Completed bridge across the Tagus estuary is the largest in Portugal. Officially opened last December, it greatly eases the problem of access to Lisbon.



A cross section of the Tagus River Bridge at the river spans.

within a tubular steel extension, which was connected to and driven together with the bottom part.

In the laying of the foundations for the river piers, a method was adopted by the contractors that had been used under similar conditions for several important bridge foundations in the Danish fjords. At the site of each pier, the silt was dredged from the riverbed to suitable depths, and fillings of sand deposited in its place. Through this, and into the sand and gravel sublayer of the riverbed, round hollow RC piles, of a maximum length of 24.5 meters and 66 centimeters in diameter, were driven to a sufficient bearing to support a working load of 120 tons. They were left projecting through the sand filling on the riverbed, to be incorporated later into the concrete foundations.

The base of each river pier takes the form of a caisson of reinforced concrete. These were prefabricated and launched from a floating dock of reinforced concrete, which had to be specially constructed on the job, since it was found impossible to build a suitable slipway near the bridge site. The caissons, floating pneumatically, were then taken out to the site of the pier, and, by admitting water as ballast, dropped over the projecting tops of the piles.

By forcing the water out of the working chamber with air pressure, and by filling the hollow piles and the working chamber with concrete placed under compressed air, the lower parts of the substructure were completed. Subsequently, the upper compartments of the caisson were filled with concrete in the open, and the pier shaft built to full height.

Superstructure

Just over 3,000 tons of steel were used in the construction of the five arches of the bridge itself. Of this about 57 per cent was high-tensile steel. All the steel was supplied from the Dorman, Long Works at Middlesborough, England; two of the spans were fabricated at the Dorman, Long Bridge and Constructional Works at Middlesborough; and the remaining three spans at the works of Braithwaite & Co., West Bromwich. They were shipped from England in sections of up to 7½ tons weight and unloaded at the contractors' wharf at Vila Franca. From there they were transferred to the stockyard, where they were stacked unpainted to allow time for natural weathering actions to loosen the mill-scale, so that after sandblasting, the surface would be perfectly clean for painting.

The erection of the arch spans, the whole of which was undertaken by Dorman, Long, presented quite a formidable problem, the question being what kind of scaffolding to use. The riverbed was so soft, and the depth-to-bearing strata so considerable, that the normal type of falsework or scaffolding would have been extremely costly. Also, the spans did not lend themselves readily to cantilever construction.

Service Span for Erection

It was decided, in the end, to make use of the narrow shelf at the base of each pier shaft to support a service span, which would be built up on pontoons and floated in turn to each opening between the piers. The variation in clearance above the water level and the strong winds and currents made this a complicated task. However, though on several occasions operations had to be postponed because of strong winds or unfavorable tidal conditions, there was no mishap.

The job was done in this way. Steel pontoons of 500-ton capacity, with specially reinforced hulls to carry the concentrated load of the 380-ton service span, were towed to the site from Rotterdam, Holland. A steel superstructure was built upon and between the pontoons, the height of which was adjustable for clearance purposes at the various archways. The service span, 325 feet in length, was then assembled on the superstructure at the contractors' wharf. The whole structure was then towed out and maneuvered into position opposite the opening for the first bridge span, where it was moored. At low tide it was placed in position. By admitting just enough water into the pontoons, they were sunk deep enough to deposit the service span on its correct bearings on the shelves of the piers. Further slight sinking of the pontoons allowed them, together with their steel superstructure, to be withdrawn by their moorings and taken away, leaving the service span in position. Clearance between the service span and the piers was so slight that the whole of this operation called for great precision and involved acute navigation problems.

Suitable packings were then laid out on the top of the service span, and the permanent steelwork assembled by means of a 7½-ton locomotive crane. This completed, the service span had to be withdrawn and placed in position at the next opening. Withdrawal was even more complicated, since the additional problem of overhead clearance had to be taken into account.

When the permanent steelwork had been completed, it was supported on jacks from the tops of the piers, the packings having been removed. This gave sufficient clearance for the removal of the service span, provided it was done quickly. Delay on a rising tide would have resulted in the service span being trapped between the water and the underside of the permanent bridge.

The operations with the pontoons and their superstructure were this time in reverse. First, they were flooded and sufficiently sunk. Then, they were warped into position under the service span at low tide. Steam pumps extracted the water ballast, causing the superstructure to make contact with the underside of the service span. Pre-

(*Concluded on next page, col. 3*)

YOU GET MORE FOR YOUR MONEY WITH Firestone TIRES

Because there is more built into them!

FIRESTONE off-the-highway tires give you more for your money because they are engineered and built with the extra advantages that reduce downtime to a minimum.

New TENSION DRIED, SUPER GUM-DIPPED cord construction gives extra long body life, because you get more retread service and fewer downtime losses. There's no tire growth. Clearance and mating problems are simplified. There's no tread cracking. Cuts don't "grow." There's a 60% stronger bond between cords and body rubber to give you the strongest body ever built.

Firestone off-the-highway treads last longer because they're built double thick with *extra* tough, cut-resisting tread stock. Four *extra* tread plies absorb shocks and give maximum protection against impact breaks. The sidewalls are *extra* thick and snag-resistant.

AMERICA'S FUTURE PROGRESS DEPENDS ON BETTER AND SAFER HIGHWAYS

Let your Firestone Dealer show you how the many extra body and tread advantages of Firestone Tires give you more for your money.

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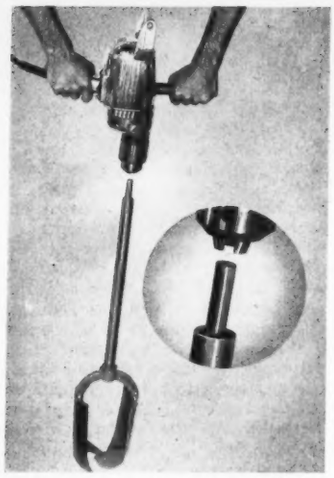


This post-hole digger operates from a ½-inch or larger drill. It is made by the Hole-A-Minit Division, Eugene John Freeman & Co., P. O. Box No. 2143, Van Nuys, Calif. Circle No. 623 (card at page 16) for further information.

Protective Coating For Plywood Forms

A new coating which protects plywood forms from weather, handling, and concrete action is announced by L. J. Kissling & Sons, P. O. Box 21, Long Island City, N. Y. Technicote B-5009 is a non-petroleum, non-bituminous coating, which is applied by spraying, dipping, or brushing. Two coats are recommended. No thinning or mixing is required and it dries in 20 minutes.

The company points out that the first application penetrates the wood and seals the pores, and the second binds the surface fibers and prevents lifting of the wood grain. Hammer blows, stripping, and exposure to the elements are said not to harm the coating.

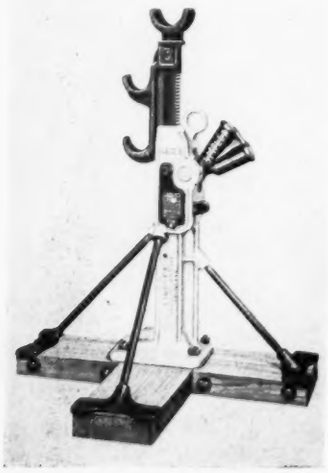
Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 585.

Aluminum Reel Jack

A lightweight reel jack with 10-ton capacity has been announced by Templeton, Kenly & Co., 1020 S. Central Ave., Chicago, Ill. The Simplex A1029 features an aluminum housing that reduces weight 21 pounds. A single-acting jack, it has a rugged, laminated oak T-base.

The A1029 is particularly recommended by the company for field work, where its light weight minimizes fatigue in loading, unloading, and carrying to location, and reduces the load on utility trucks. Closed height is 29 inches; lift 13¾ inches; weight 83 pounds. A 5-foot lever bar is supplied.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 570.



An aluminum housing that reduces weight by 21 pounds is the feature of the Simplex A1029 reel jack.

New Warehouse for Kyle

New steel warehousing and distributing facilities have been completed by Kyle & Co., San Francisco distributor and fabricator of steel and other metals and metal products. The new warehouse, a Kyle Standard metal building, at 500 Richard Blvd., Sacramento, will maintain complete stocks, enabling customers in the Sacramento area to operate with minimum inventories. The company has other warehouses in Stockton and Fresno, Calif.

New Bridge Spans Tagus in Portugal

(*Continued from preceding page*)

cision in this respect was achieved by means of special centering and locking devices. Finally, the whole weight of the service span was taken up by the pontoons and withdrawal from the opening effected. The bridge span was then lowered by the jacks into permanent position.

Material, Costs, People

Additional figures for quantities of material used include 31,000 cubic meters of concrete; 9,800 tons of cement 3,700 tons of reinforcing steel.

Of the total approximate cost of 120,000,000 Portuguese escudos, the estimated cost of foundation and approaches is 72,000,000 escudos; and that of the five steel spans, 48,000,000 escudos.

Apart from about a dozen Dorman Long Bridge Department key men, local labor was employed on the site. J. F. Pain is Manager of the Dorman Long Bridge Department and a director of the company. W. Cardno was the firm's Agent at Vila Franca de Xira and D. H. Field was the Engineer on the site.

Allis-Chalmers HD-20 Tractor

gives HIGHER OUT

Exclusive Hydraulic Torque Converter Drive Is One BIG Reason Why

The hydraulic torque converter drive, *exclusive* in the Allis-Chalmers HD-20 Tractor, brings you productivity, handling ease and dependability that makes every hour, every day of the season count . . . gives the operator the equivalent of hundreds of gear ratios in two speed ranges . . . automatically selects the proper speed for maximum production.

Dozing — With hydraulic torque converter drive you take full advantage of available horsepower . . . roll bigger loads, tackle tougher dozing jobs. Master clutch engages under cushioned protection, yet power is achieved *instantly* with velvet-like smoothness. This means fewer repairs . . . longer life of tractor and auxiliary equipment.

Pulling — There's nothing like the HD-20 for sheer productive power. Torque converter actually multiplies torque up to four and one-half times . . . develops tremendous drawbar pull to start the load smoothly, and automatically accelerates to highest speed conditions permit, in either high or low range.

Excavating — With full horsepower available even at creeping speed, and shifting virtually eliminated, the operator can concentrate on his front-end shovel completely . . . crowd surely and steadily . . . start and stop with a touch of the throttle.

Pushing — The HD-20 makes smoother contact, automatically matches speed to pushed equipment, maintains steady contact while loading, sends load off to the fill in a higher speed.

Get the full story now from your Allis-Chalmers dealer. See why the HD-20 does more work, more easily, at less cost . . . and why it is worth waiting for.

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ASTM Celebrates Fiftieth

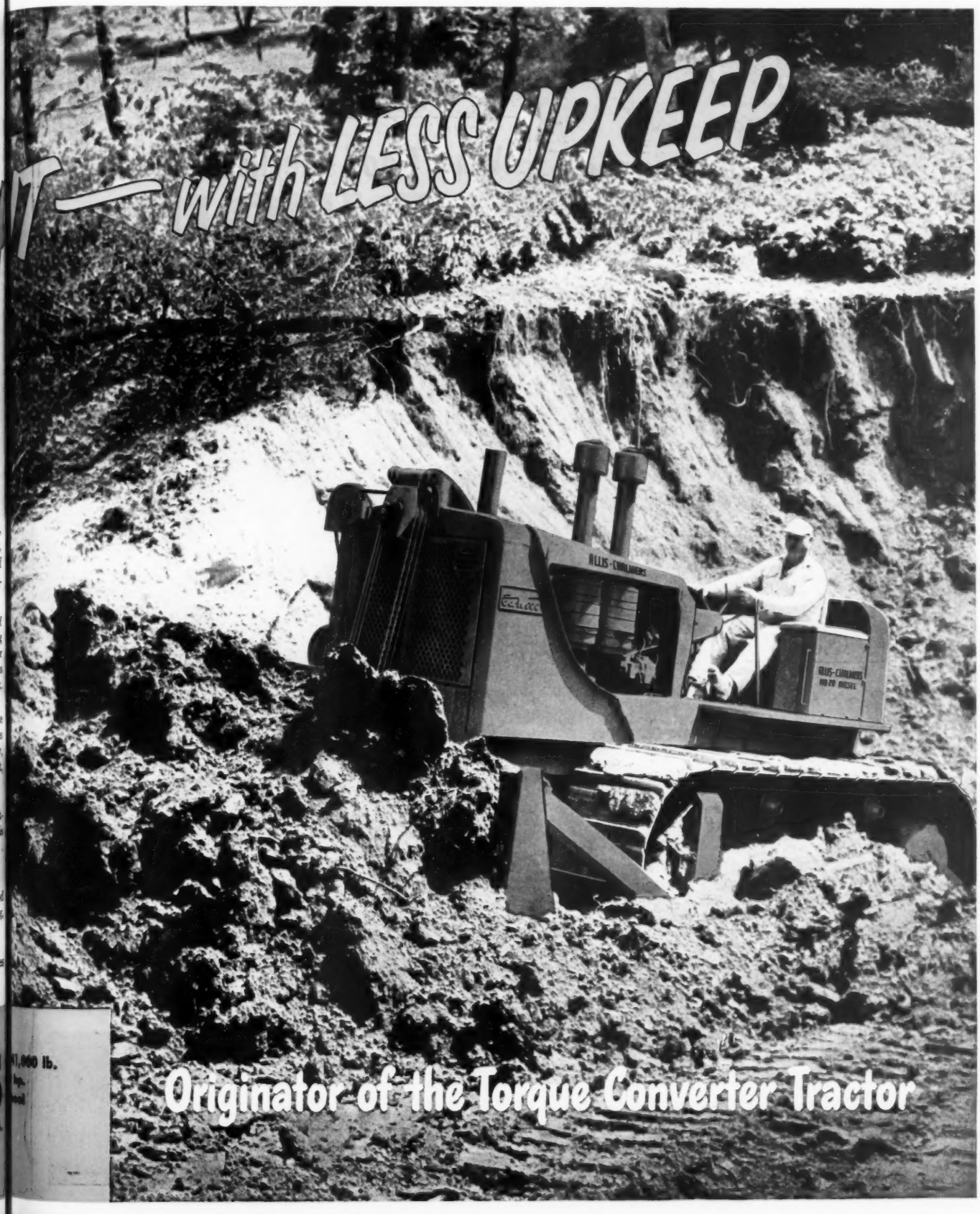
A record-breaking 2,606 engineers and materials men attended the fiftieth anniversary meeting of the American Society for Testing Materials in New York City last June. A strong technical program commemorated the Society's formal incorporation as a national technical society in 1902; some 165 papers and 70 reports were presented and technical committees held 450 meetings. On display was the Society's largest exhibit of testing apparatus and scientific instruments.

As a result of recommendations in the committee reports, 75 new specifications and tests were approved for publication for the first time. The majority of the committees had concentrated during the first half of this year on revising their standards for the 1952 edition of the "Big Book" of ASTM Standards to be issued later this year, and in reviewing tentatives to be adopted as final standards. Some 90 existing tentatives were recommended for adoption as formal standards, subject to Society letter ballot. Also there were about 270 standards and tentatives in which revisions are to be incorporated.

A highlight of the convention was the presentation of three awards to authors of outstanding technical papers read at previous ASTM meetings. The Charles B. Dudley Medal was awarded to Norman W. McLeod, Engineering Consultant, Department of Transport, Ottawa, Canada, for his paper entitled "Application of Triaxial Testing to the Design of Bituminous Pavements". Thomas J. Dolan, Research Professor of Theoretical and Applied Mechanics at the University of Illinois, received the Richard L. Templin Award for his paper, "Electrically Excited Resonant-Type Fatigue Testing Equipment". The Sanford E. Thompson Award was made to H. F. Gonnerman, Assistant to the Vice President in Charge of Applied Research, and William Lerch, Manager, Department of Applied Research, both of the Portland Cement Association, for their paper, "Changes in Characteristics of Portland Cement as Exhibited by Laboratory Tests over the Period 1904 to 1950".

The 1953 Annual Meeting of the Society will be held at the Hotel Chalfonte-Haddon Hall, Atlantic City, N. J., from June 29 to July 3 inclusive. The 1953 Spring Meeting and Committee Week is scheduled for March 2 to 6 at the Hotel Statler, Detroit, Mich.

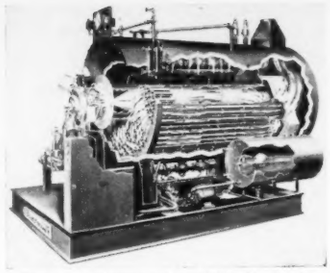
Insure your own personal security and that of the nation by regular investment in U. S. Defense Bonds.



Package-Unit Boiler

A horizontal fire-tube boiler of three-pass internal furnace construction is the main feature of the automatic packaged steam generator made by Orr & Sembower, Inc., Morgantown Road, Reading, Pa. Powermaster boilers are built in 16 sizes from 15 to 500 hp for pressures up to 250 psi. Heat transfer is from 4.5 to 5.0 square feet per boiler horsepower.

Voriflow burners for light oil, heavy oil, and commercial gas fuels, as well as dual-combination burners, are said to modulate with uniformly high efficiency between 30 and 100 per cent of full-load rating. Combustion gases travel through the central combustion tube, reversing their flow back through the lower bank of tubes, then branching toward the rear through two lateral banks of tubes. Front and rear covers are readily removable for inspection. The cylindrical combustion chamber assures complete combustion within the furnace. The boiler-feed and condensate-handling system is optional. A completely integrated control system and interlocking safety devices are an integral part of each unit.



Here's a cutaway view of the Package-unit Powermaster boiler.

Further information may be secured from the Company. Or use the Request Card at page 16. Circle No. 572.

Unemployment-Tax Cuts: File Before September 30

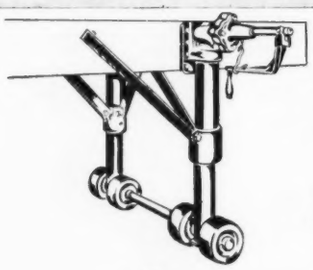
However steady a payroll your business has kept, you cannot qualify in New York State for a 1953 tax cut in unemployment insurance unless you have submitted by the end of this month all quarterly tax reports due since the first calendar quarter of 1949.

The New York State Labor Department reminds all firms covered by the State Unemployment Insurance Law that to qualify for a reduced tax rate in 1953, they must (a) have paid remuneration to employees in 1951; and (b) have submitted by September 30, 1952, at latest, all quarterly reports (Form IA-5) due for the 14 calendar quarters from January 1, 1949, through June 30, 1952.

QUALITY LEADERS SINCE 1910

Holland Engineered

TRUCK-TRAILER EQUIPMENT FOR THE CONSTRUCTION INDUSTRY

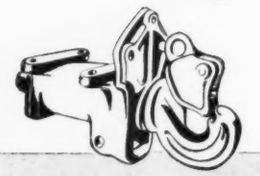


FIFTH WHEELS

All types of 5th wheels—including the famous Apgar Safety 5th Wheel that eliminates jack-knifes and tip-overs.

LANDING GEAR

Both vertical and horizontal types to meet every load requirement.



PINTLE HOOKS

For every use, every load plus a complete line of towing hooks, towing rings, trailer couplers, king pins and king pin adapters.

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SUPERIOR PRODUCTS ACHIEVED THROUGH 40 YEARS OF LEADERSHIP AND SERVICE

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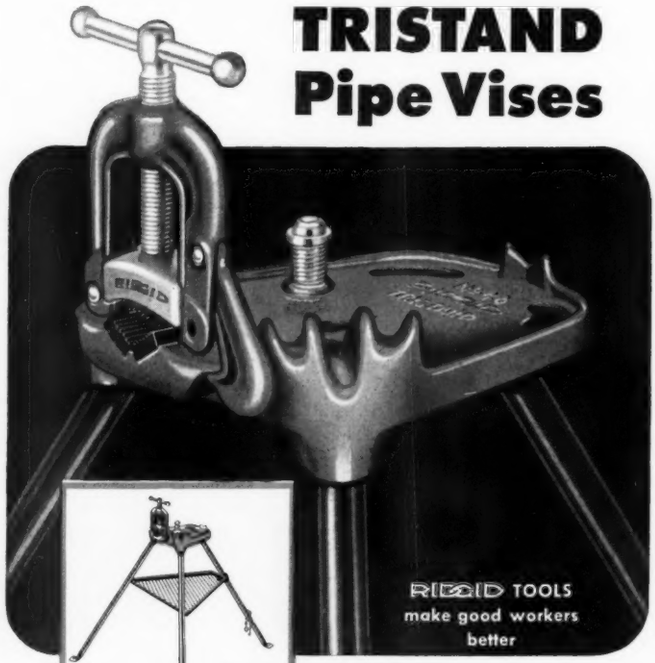
Why Good Mechanics Demand RIDGID

New No. 40

TRISTAND Pipe Vises



Handy tray keeps your tools at your fingertips

★ Tristand is really a portable workbench with a vise—roomy top tray has pipe benders and pipe rest; tool tray below keeps tools handy.

★ That tool tray also makes Tristand extra rigid—won't fold up in use.

★ LonGrip tool-steel vise jaws won't slip, are easy on polished pipe or tubing.

★ No. 40 yoke vise Tristand is 2½" capacity, No. 45 chain vise 4"—buy these work-saver RIDGIDs at your Supply House!

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RIDGID Work-Saver Pipe Tools

Full power behind both drills with Jaeger air-plus pressure

75 ft.
125 ft.
185 ft.
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600 ft.

By using a "new standard" Jaeger 365 compressor instead of a 315 on this by-pass bridge approach at Shelton, Connecticut, Mariani Construction Co. was able to hold a 4" wagon drill at top efficiency, averaging 300' per day in shale, *and operate a hand-held drill at the same time.* All Jaeger sizes offer like advantages—more air per dollar, more production per hour.

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Cuba Is Modernizing Its Highway System

National Commission Directs Plans For the Island's Roads: Bridges, Tunnels Cross Rivers en Route

• A CAMPAIGN is under way in Cuba to improve the country's highway system—an undertaking that involves not only the roads themselves, but a considerable number of water crossings over the island's rivers and streams. Of a total of $95,000,000 worth of public works projects some 42 per cent is being allocated to highway improvement, and a newly formed body, the Comision de Fomento Nacional (Commission of National Development), is in charge of operations.

Bridges

There is nothing standardized about Cuba's rivers. Seasonal rains on the tributary watersheds affect the flow and velocity of streams in varying degrees, and this gives each water crossing its peculiar problem. Bridges, therefore, are seldom of standard design. The following are some examples of their variety.

Canimar Bridge: Spanning the River Canimar, the bridge is situated on the main highway between Havana and the seaside resort of Varadero. Its construction saves a detour of some 25 miles each way and enables the highway to carry on in a straight line. The bridge is a three-span concrete arch bridge; each span is 215 feet long and the over-all length, including the two approach spans beyond the arches, is 983 feet. There is a rise of 108 feet above the spring line at the abutments.

Maximo Bridge: This bridge crosses the River Maximo and forms part of the highway between Sola and Minas—a highway which serves an important sugar-growing district and links it with the railroad and so with the ports of shipment. The bridge is concrete with a 92-foot center span and two end spans of 75 feet each. Anchored cantilevers support the center suspension span.

Canas Bridge: A prestressed-concrete bridge spanning the River Canas on the south-coast highway between Trinidad and Cienfuegos. This highway is the first all-weather route for trucks and automobiles in Trinidad. Trails and river fords were all that existed before, and freight and passengers traveling to and from Trinidad had to take circuitous railroad routes and coastwise vessels. The Canas Bridge has a center span of 250 feet and two end cantilevers, each of 40 feet.

Tarara Bridge: Situated on the highway between Havana and Guanabo, this bridge spans the River Tarara. The river, though narrow in dry weather, widens considerably during the rainy season, and the bridge—a concrete structure of precast-concrete piles—has 15 prefabricated 46-foot slab spans. The width of the roadway between walkways is 42 feet.

These are just some examples of dissimilar bridges, but there are many smaller concrete bridges of standard simple-span design, and, where required for highway drainage, concrete culverts of appropriate sizes.

Underwater Tunnel

Between Miramar and Vedado—two residential districts of Havana—it was decided to build a tunnel under the River Almendares to take care of the growing volume of traffic. Before the construction of this tunnel, the only crossings were two bridges, which were adequate at the time they were built. However, Miramar and the suburb of Mariano grew so quickly that traffic bottlenecks were always forming at the two bridges and something had to be done. A low-level bridge was not feasible because of the anchoring of so many private yachts in the upper portion of the Almendares; as to a high-level bridge, when comparative costs for this and for a tunnel were worked out, the latter proved the more favorable. The reinforced-concrete tunnel has four traffic lanes, two in each direction. It is planned to do away eventually with the existing bridge, which is badly deteriorated, and this will make landscaping easier.

Highways

As for the highways themselves, various kinds of surfacing are included in the program, and designs for medium and heavy traffic. Since they compare favorably with roads of similar construction in the United States, the Commission expects that with normal maintenance Cuba's highways will stand up well to the traffic they have to bear.

Two heavy-traffic highways are the Havana-Guanabo and the Matanzas-Varadero Highways, which are taking an increasing volume of truck transportation. The Havana-Guanabo has a Telford base, covered with penetration macadam, 2 gallons to the square yard. The surface is 2-inch asphaltic cement, composed of 1½ inches of coarse premixed aggregate and ½ inch of fine premixed aggregate. The Matanzas-Varadero Highway is of calcareous selected materials, covered with penetration macadam and an asphaltic-cement wearing surface as on the Havana-Guanabo Highway. A well compacted foundation plus an intermediate layer

(*Concluded on next page*)

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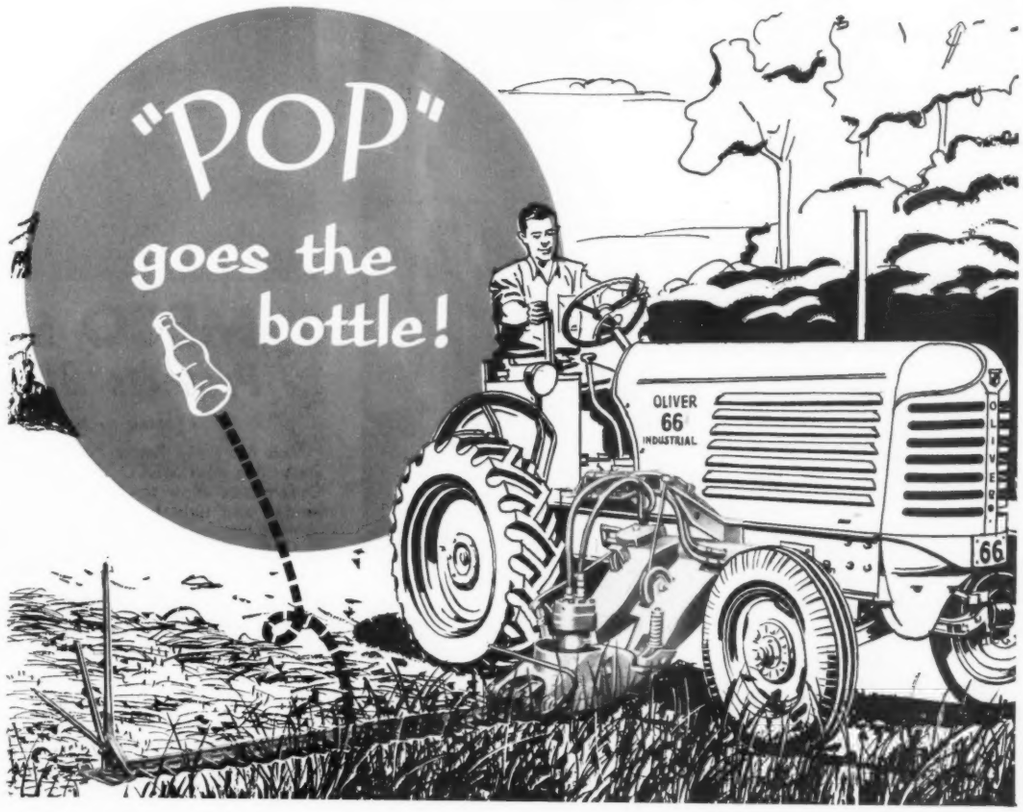

But Not the Mower with an OLIVER Hydro-Cut!

Yes, here's the mower that not only cuts anything from thick matted grass to heavy brush but also cuts maintenance costs to the bone . . . *50% and even more according to cost records of users!*

When an Oliver Hydro-Cut hits a bottle . . . a piece of wire or other roadside debris, you don't lay up the mower for expensive repairs. With the ordinary mower, this impact breaks or damages knife sections, guards, knife heads and even pitman drives.

The Oliver Hydro-Cut is hydraulically operated; there is far less impact when the cutter bar strikes debris. The "metal in motion" behind the knife in an Oliver is approximately 22 pounds as compared to over 100 pounds for a mechanical mower. It is the vastly increased impact load in the ordinary mower that causes the excessive damage and maintenance costs. And, for extra safety, Oliver has a hydraulic blow-off valve which instantly unloads the force behind the knife when the mower strikes an obstruction.

If you're interested in saving hundreds of dollars in maintenance costs per year, see or call your Oliver Industrial Distributor.

THE OLIVER CORPORATION
19300 Euclid Avenue, Cleveland 17, Ohio

A complete line of industrial wheel and crawler tractors

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Cuba is Modernizing Its Highway System

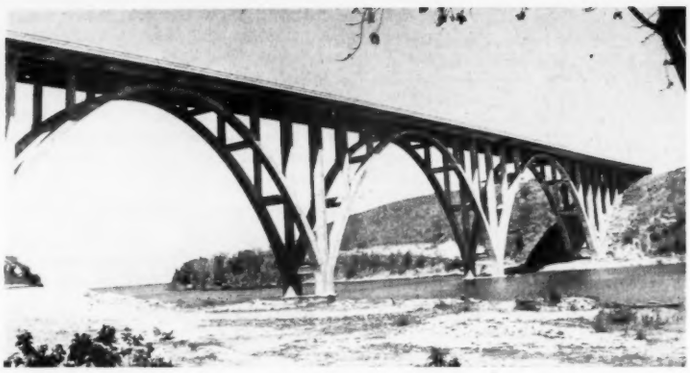
(*Continued from preceding page*)

of penetration macadam and a hot-mix wearing surface form the basic construction of these and other heavy-duty roads.

Other types of road include: asphalt penetration over Telford base; asphalt penetration over serpentine base of selected materials; inverted penetration over calcareous base of selected materials. Serpentine is found in many parts of Cuba, which gives it an economic advantage over other suitable aggregates which are scarce and have to be hauled long distances. Laboratory tests are still going on to determine the best way to handle serpentine and to differentiate between poor and good qualities of the aggregate.

Organization

Amadeo Lopez Castro, Engineer, is President of the Comision de Fomento Nacional and its Chief Engineer is Dionisio Suarez. The Havana branch of Frederick Snare Corp., New York, N.Y., is Consulting Engineer to the Commission. The Commission's powers cover not only the modernization of the highway system, but also that of communications, navigation, and other projects beneficial to Cuba's welfare. Cuban engineers engaged in the various projects are planning to use local materials wherever possible. While they are paying special attention to districts with the densest population, individual projects are distributed in such a way as to benefit the whole island.



Canimar Bridge, situated on the main highway between Havana and Varadero, is part of Cuba's modernized highway system. Crossing the River Canimar, it is a 3-span concrete arch bridge; each span is 215 feet long; and the over-all length, including the two approach spans, is 983 feet.

Data on Portable Compressor

Literature on a portable compressor with 30-cfm delivery is available from P. K. Lindsay Co., 97 Tileston St., Everett 49, Mass. The T-33 is mounted on two semielliptical springs with heavy pneumatic-tired wheels. It comes with a toolbox, tow bar, and detachable foot and tow hitch.

The unit is powered by an 11-hp engine at a speed of 1,800 rpm. It is 49 inches high, 38 inches wide, 83 inches long, and weighs 600 pounds.

This literature may be obtained from the company, or by using the Request Card that is bound in at page 16. Circle No. 596.

On the job...and on the bond

EXPERIENCE COUNTS

Erecting a magnificent arc of steel and concrete over broad reaches of rushing water demands the ultimate in skill and ingenuity. Yet American engineers and construction men have what it takes to do the job.

What it takes is cumulative *experience* — without which little could be accomplished in *any* field.

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(Tested successfully against jet fuels and fire)

You can make better blacktop installations with MECO Surface-Seal. Contractors know that MECO seals, renews and tightens the surface, as well as beautifying the pavement. It is particularly useful on areas which take a lot of punishment. Gas stations, parking lots, airports and private driveways use it because it is weather and solvent proof.

Economical and easy to use, MECO Surface-Seal will give you a better job on your next blacktop contract. Makes old driveways new—makes new jobs last longer. Write for folder and names of satisfied users. Distributors in all major cities.

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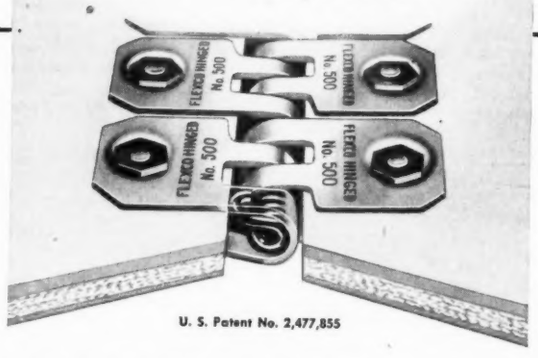

U. S. Patent No. 2,477,855

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Prime Factors in Planning Prestressed-Concrete Work

Considerations Must Include American Costs and Methods, Failure Loads, Safety Factors, and Codes

By M. FORNEROD, Chief Engineer, Preload Enterprises, Inc., New York, N. Y.

• IN the early history of prestressed concrete the only criterion for the merit of a design or a method of construction was the physical behavior of the structure. Though the cost of the structure could not be too far out of line, many of the earlier examples of prestressed construction were initiated either because there was a substantial saving in critical steel or because there was some structural advantage which could not be properly evaluated in dollars and cents.

The stage where prestressed-concrete construction was considered a mere expedient has passed. We have entered an era where its success in competition with alternate solutions is the primary consideration. In the final analysis, cost usually governs the owner's decision if comparable quality is assured. While the unavailability of steel is again a powerful factor in favor of prestressing, this fact should not be counted upon in its long-term development. Real development usually comes as a result of a commercial incentive.

In tank construction and pipe manufacture, prestressing has already established itself sufficiently to be included as an alternate, almost without solicitation, in the majority of projects. There have also been economical applications of prestressing for buildings, bridges, gravity concrete dams, landing strips, piles, railroad ties, etc. Since it is not feasible to cover all fields of prestressing in a short presentation, this paper is confined to bridge and building construction.

Factors Affecting Cost

Under the present methods of bidding on alternate designs of a bridge project, serious consideration is given to a prestressed alternate only if it is sufficiently attractive cost-wise to the general contractor.

The most important factors which determine the cost of a prestressed structure are: simplicity of construction and prestressing operations, since they must be adapted to the American labor market; selection of spans, cross-sections, and design details which are adapted to such methods of construction; carefully studied construction sequences to avoid undue delays or extra equipment costs; and a set of logical design criteria which take best advantage of the special features of prestressed concrete and at the same time give a reasonable and consistent factor of safety against cracking and failure.

Design Considerations

Once the bridge designer establishes these facts he must ascertain the specified loading, roadway elevations, clearances, foundation conditions, etc. Then he is free to use his own judgment as to span length, type of cross section, statical system, etc.

Experience has shown that prestressed concrete can bridge longer spans than ordinary reinforced concrete. Since the dead-load moments are already compensated for by prestressing, smaller construction depths are possible, with a corresponding saving in dead load. Construction depths one-twentieth of the span are very common in simple girders. The largest span of the Galion Bridge in Brazil has a ratio of depth to span of 1 to 75. In long-span girder designs it is possible to effect considerable savings in the cost of piers and foundations. This is especially true where arches would cause serious foundation trouble.

There are, however, certain considerations which limit span length. The first is that with increasing span length the ratio of dead load to total load increases, and that at a certain point, even in prestressed concrete, there is a definite economic limit to span length. Maximum deflections must also be checked, although this is seldom a serious limitation.

Other factors affecting the selection of the optimum span are the cost of scaffolding and forms, the cost of pouring concrete *in situ* versus precasting and handling of girders, or the cost of a combination of both for various parts

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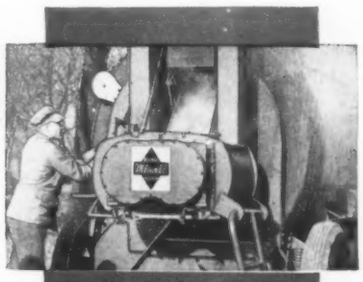

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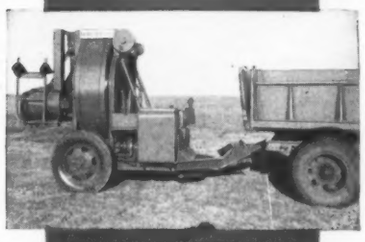

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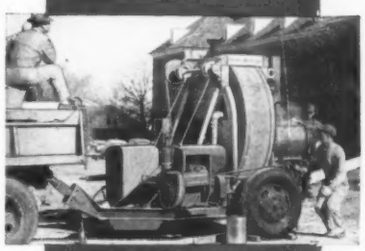

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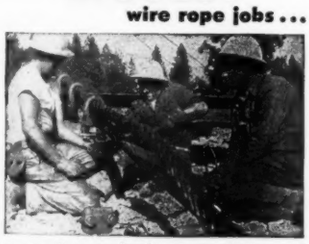

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Factors in Planning Prestressed Concrete

(*Continued from preceding page*)

of the structure. The cost of end anchorages and the number of prestressing operations favor the use of long spans. But existing handling equipment often sets a limit to the span of precast girders.

It is difficult to generalize on the merits of various statical systems and methods of construction, but there are two extremes which have excellent possibilities when used in the proper places. One of these consists of a relatively small number of large spans forming a continuous girder prestressed from end to end with a minimum of stressing labor and fittings. Such a project, however, requires considerable scaffolding and *in-situ* pouring of concrete. The other typical case is a structure consisting of a large number of relatively short equal spans arranged as simple beams. Here the high degree of standardization and complete prefabrication of the girders is very economical. More recently, builders have even used individual precast girders for continuous-girder bridges. Continuity is established through special jacking operations over the supports. This method requires nominal prestressing of the individual girder for handling, and final prestressing to establish continuity. In this case the determination of optimum span length is subject to a temporary statical system which differs from the final one.

One of the most important factors determining span length is the type of bridge cross section and the shape of the cross section of the individual girders. The first basic requirements are a minimum cross-sectional area and section modulus to satisfy the stress limitations in the elastic range for all construction stages. Another factor in the selection of the shape of the girders is the practical arrangement of prestressing wires or cables and their end anchorages. The most frequently used shapes for girder cross sections are I-beam sections, hollow-box shapes, T-sections, and, for smaller spans, full or hollow rectangular slab sections. Prestressing units are placed inside prepared longitudinal sheaths, or they remain exposed along the sides or hollow parts of the girders.

In many designs the deck slab of the bridge becomes an integral part of the girder at a later construction stage, and can be included in the effective cross section for live loading.

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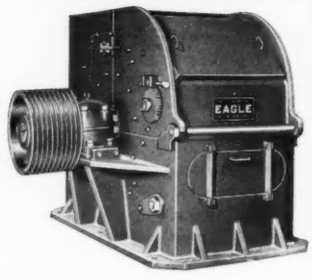

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mate range of economical spans of various types is as follows: slab bridges, 30 to 80 feet; simple span girders, 60 to 150 feet; continuous-girder bridges and flat prestressed arches or tied-girder bridges, 80 to 350 feet.

Comparison with RC

When a final prestressed design must be judged, a cost comparison with a conventional reinforced-concrete design gives some indication of its merits. Unfortunately cost records of American prestressed structures do not, as yet, allow any kind of general conclusion—and European cost experience cannot be applied under our labor conditions.

Comparison of material quantities alone, however, is an indication that considerable savings are possible with prestressed designs. As a rule concrete quantities are reduced by approximately 25 per cent and the steel tonnage is about one-quarter of that used in conventional reinforced concrete. In circular tanks and pipes these reductions are even more pronounced.

Cost studies invariably bring up this question: what is an equitable basis for comparing prestressed design with reinforced-concrete design? Existing code limitations cannot be applied. They must be modified because they were not intended to cover stress conditions which are typical in prestressed-concrete design. A short discussion on safety factors is therefore appropriate.

Safety Factors

The concept of failure must be clearly defined, because what might constitute failure in steel or cast iron does not necessarily mean failure in prestressed concrete: for example, in a prestressed-concrete pressure pipe in which cracks close up again even after considerable overload, there is no such thing as a bursting pressure, such as in steel or cast-iron pipe.

One concept of failure is: "A state of permanent damage where the structural member becomes useless for all practical purposes. The ratio of the load carried just before reaching such a state of uselessness to the normal working load is the safety factor as ascertained by tests."

Through suitable calculations the designer attempts to predict as closely as possible the safety factor which provides a consistent and reasonable margin for overloads and uncertainties in design, and also for tolerances in materials and unpredictable factors in construction. The magnitude of this margin should not be selected arbitrarily but should be determined on a probability basis of variations of loads and of resistances. Failure is never impossible, but it can be prevented with a selected degree of probability. A prerequisite for this is the knowledge of the range of variations of all factors which affect the resistance of the structure as well as the probability of overloads. The minimum factor of safety is for a condition where failure is just barely prevented, when an upward variation of the load coincides with a downward variation of the resistance of the structure.

These principles have been well described by Professor Freudenthal of Columbia University. This approach to determining safety-factor criteria seems to be particularly appropriate for a new structural method such as prestressed concrete.

Due to many uncertainties in the early development of prestressed concrete, extreme safety precautions were justified. Today a more methodical elimination of risk is possible, since tests indicate fairly close agreement between estimated and actual safety factors. Before recommending minimum values of safety factors against failure, all circumstances of a case should be known. Frequently used values in important structures average 2.25 if based on total load and 3 if based on live load only.

Prestressed-concrete design is unique in that it provides a safety factor against cracking. The degree to which the formation of cracks should be prevented is a matter of personal judgment. In pipe design the cracking limit is of prime importance; in bridge and building work, safety against failure is more essential. In the past, safety against cracking has been rather overemphasized. Extreme cracking safety in a girder, for example, can only be obtained at the price of brittleness. This type of girder is over-prestressed and shows a very undesirable sudden type of failure.

Depending on the probability of overloads and the type of exposure, one can use a ratio of cracking load to working load of 1.2 to 1.5, if the tensile strength of concrete is completely disregarded, and of 1.4 to 1.7 if part of the flexural strength is taken into account.

The cracking load is often also called the transformation load. This perhaps better emphasizes its significance, since as soon as this transformation load has been exceeded, a normal prestressed girder is transformed into an ordinary reinforced-concrete girder —that is, the amount of prestressing does not materially affect the ultimate load capacity. Only in over-reinforced prestressed beams does the prestressing delay failure sufficiently to be a noticeable influence in failure tests. In such cases estimates of the failure load become rather uncertain.

Failure Load

Once the desired safety margins for a project are established, the designer must be able to predict, within reasonable limits, the failure load of his design.

There is ample evidence that as a prestressed girder approaches failure the plastic characteristics of both concrete and prestressing steel become more and more predominant. The designer is, therefore, confronted with the problem of interpreting, at each stage of the process, inelastic deformations in terms of load increments. Much has been published on the subject of the so-called plastic or ultimate theory of design, and the controversy over its validity and its justification is still going on. The majority of authors on the subject propose to assume or to establish experimentally the

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Factors in Planning Prestressed Concrete

(*Continued from preceding page*)

stress-strain relationship of concrete, and subsequently use it in an idealized form in the calculations, combined with graphical methods of integration. Accordingly various shapes have been proposed for the compressive-stress block at the top of the girder, such as trapezoids, parabolic shapes, rectangular shapes, etc. More recently Professor Baker and Mr. Prentis, of the Imperial College at the University of London in England, have described a method of obtaining the correct plasticity factor from bending tests on prestressed beams.

Such failure calculations are very logical, but very rarely are all the data on the plastic behavior of the concrete known at the time the design is made. This is especially true since these stress-strain curves depend on whether a rapid loading or a sustained loading is used. A number of fairly arbitrary coefficients must, therefore, be assumed. Under these circumstances it seems legitimate to replace complicated curves of the compressive-stress block, such as fifth-degree parabola, by a simpler figure, such as a rectangle, if it is borne in mind that this is only a device to simplify analysis and does not represent physical facts. The final result does not vary greatly and its degree of accuracy is consistent with the other uncertainties involved.

Actual test failure loads as reported by various investigators are generally in fairly good agreement with calculated resistance loads. Any difference between actual and calculated factor of safety is usually on the safe side. The magnitude of such a difference depends on how closely the calculations express real conditions such as forces, statical system, influence of details, characteristics of materials, and control on the job.

This brings us to the subject of design codes.

Design Code

The writing of a code for prestressed concrete is not as simple a matter as it often appears at first glance. A code is intended to contain legal limitations. With prestressed concrete still in development, it seems rather difficult to cover the many factors influencing its structural behavior in a legal code at this time. If the editors of a code intend to cover all eventualities and all factors influencing the various load and stress conditions, the code becomes extremely elaborate and voluminous and comes dangerously near being an instruction book!

It might be more useful to write a manual intended only as a guide to designers and contractors. But this is no small task either, since such a manual in a short time would assume the status of a semiofficial code and would undoubtedly be referred to in many official specifications.

It seems that at this stage only the most essential principles should be dealt with in a prestressing code—the methods of determining safety factors, resistance loads, cracking loads and deflection limitations.

Taken from the paper "General Design and Economic Considerations in the Planning of Prestressed Concrete Structures" given by Mr. Fornerod at the First U. S. Conference on Prestressed Concrete. The complete paper appears in the Proceedings of this meeting, available from the Massachusetts Institute of Technology, Cambridge 39, Mass.

Roller-Chain Data Book

A new 148-page book of engineering data on roller chain has been released by Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. Sections on installation, maintenance, and lubrication take account of such factors as shaft and sprocket-wheel alignment, chain installation and chain tension, casing assembly, and methods of lubrication for varying conditions.

For reference and easy identification, the book contains photographs and line drawings of the many types and sizes of chain and sprocket wheels available. It also shows over 50 typical conveyor-chain attachments. Design notes and selection data serve as a practical textbook on the use of roller chain for both power transmission and conveying service. Formulas, charts, and diagrams simplify selection. To facilitate selection of drives, one section contains a comprehensive group of preselected drives available for delivery from stock.

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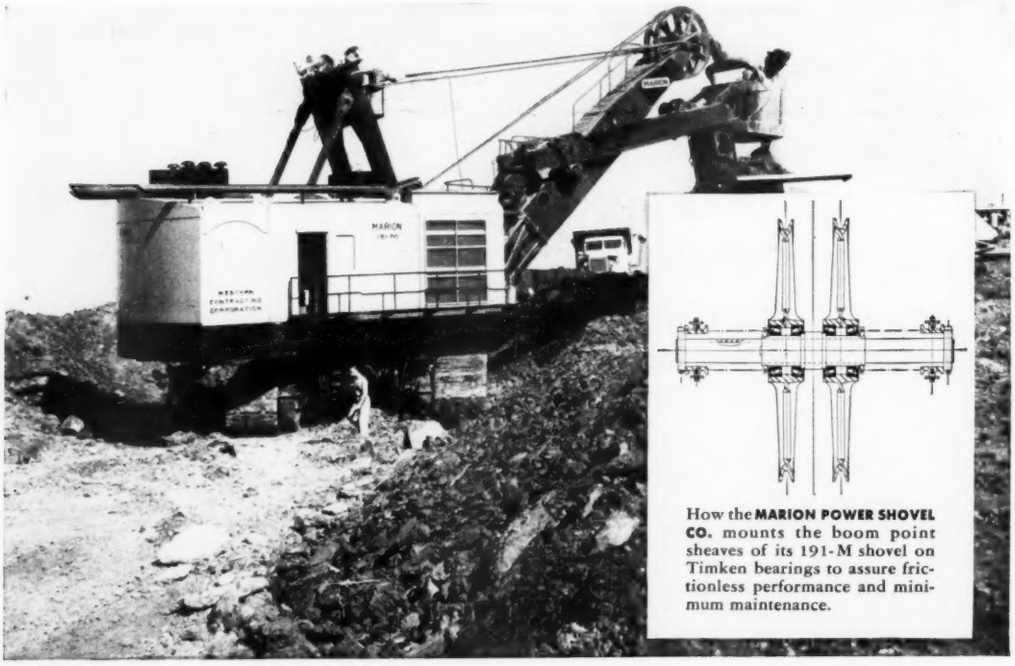

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Mobile Set Relieves Town's Power Crisis

Emergency Unit on Wheels Supplies 300 Kw to New Jersey Community After Generating-Plant Failure

• A POWER plant on wheels proved its value on July 24-27. Put into operation to relieve the overload on the municipal power plant of South River, N. J., after the breakdown of the main plant generator, the Caterpillar mobile electric set, an emergency unit, helped the town back to normal electric service.

Hooked into the power lines almost in the center of town, the Caterpillar unit generated 300 kilowatts and took part of the load off the three remaining municipal generators, which had been running above capacity for almost a week. As a result, South River's power was firmed up and its electrical appliances came back to normal working order.

To the Rescue

It all started on the night of Friday, July 18, when a piston broke in the 1,500-hp diesel engine running the main power-plant generator. For the rest of the night and for the weekend, the two remaining generators and the standby were able to handle the load. On Wednesday, Caterpillar officials in Peoria learned of South River's plight through a story in a New York newspaper. They phoned Mayor John Fitzpatrick and offered the use of a mobile electric set then being demonstrated in the Philadelphia area. The offer was accepted and Caterpillar started the set toward South River early Wednesday evening.

After new transformers were installed, Ralph Bradley, Caterpillar development engineer who came to South River with the unit, put one generator into operation on Thursday night at 9:30, taking up the load of partial night shifts in several factories which were working to make up for lost time. At 8 on the morning of Friday, July 25, the Caterpillar unit took up the load as the factories started their day's work. At noon, Jack Brodsky, a member of the board of public works, reported that the power plant's output, relieved of this 300-kilowatt load, was up to par in voltage and cycles for the first time that week.

Mobile Set

Caterpillar's power plant is a 500-hp diesel engine driving a generator which produces 315 kilowatts. Mounted on a van-type trailer, it can move to the point of need and begin operation within 15 minutes after its arrival at any location, provided the operators have received the necessary information over the radio-telephone en route.

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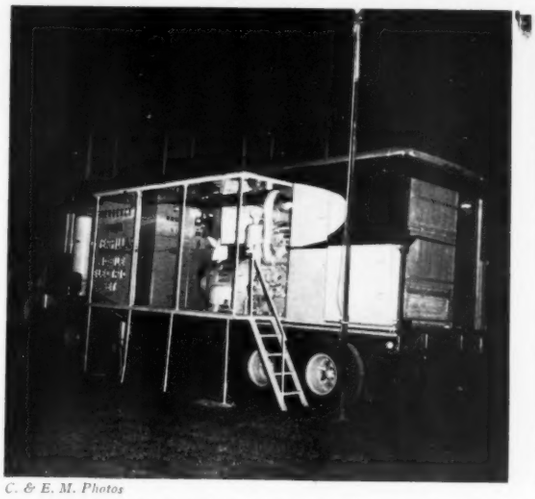

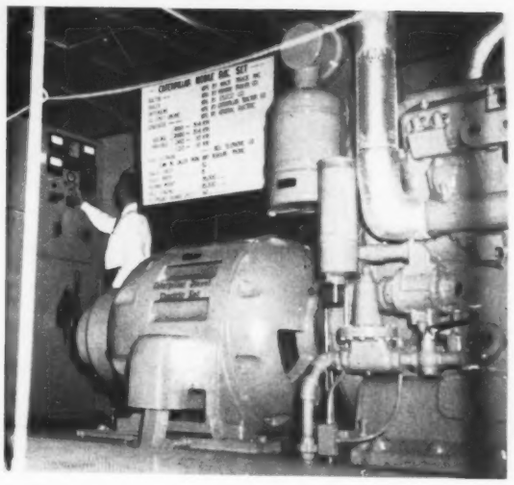

C. & E. M. Photos

Darkness closes in on the town of South River, N. J. But bright lights can be flicked on for the first time in days, thanks to this Caterpillar power plant on wheels which came to the rescue during a generator failure in the municipal power plant. Ralph Bradley, "Cat" development engineer with the 315-kw unit, checks gages to keep the lines hot.

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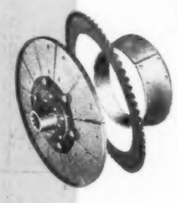

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LOS ANGELES—1110 S. Hope Street, Los Angeles 15, Calif.
PHILADELPHIA—1545 West Belfield Ave., Philadelphia, Pa.
PORTLAND—636 N. W. 16th Ave., Portland 9, Oregon
SAN FRANCISCO—424 Bryant Street, San Francisco 7, Calif.
TORONTO, ONTARIO The S. K. Wellman Co. of Canada, Ltd., 2839 Dufferin St.
EXPORT DEPARTMENT—8 So. Michigan Ave. Chicago 3, Ill., U. S. A.
WASHINGTON OFFICE—1101 Vermont Ave. N. W. Washington 5, D. C.

Mobile Set Relieves Town's Power Crisis

(Continued from preceding page)

The trailer on which the set is mounted is 32 feet long, 8 feet wide, and 12 feet 3 inches high. It weighs less than 56,000 pounds or less than 18,000 pounds to the axle, which is well within the maximum load limits of most states. It is capable of road speed of 60 mph, and can travel anywhere that a large tractor-trailer can go.

Operation of the power plant is controlled by special switchgear mounted in a compact panel. The flow of current into the selected site goes through a master switch which has an automatic cut-off for safety. Frequency is controlled at 60 cycles for all loads by a Woodward Isochronous governor of the hydraulic type. Dual-range meters are provided in order to read either 2,400 or 4,160 volts. Connections for either voltage are made by changing brass bars, which eliminates reconnecting and re-taping leads.

Guide lights are supplied for synchronizing with an existing power hookup in the event lines become overloaded or voltage drop is experienced on the end of a main transmission line. A reverse-current relay trips the main breaker in the event the diesel engine runs out of fuel. This prevents the generator from being motored from the main line with which the mobile unit may be synchronized. Safety devices include overspeed trip, water-temperature alarms, and oil-pressure alarm. One man can operate the whole plant.

The Mobile Electric Set carries 150 feet of special lead-in cable on a drum under the trailer. Auxiliary cables can double or triple this lead-in, which can be connected into any standard power line of 4,160 or 2,400-volt current, even when the line is "hot". Voltages other than 4,160 or 2,400 require the use of transformers.

The unit can be operated for an indefinite period without variation in its 60-cycle current. The engine burns ordinary furnace oil at the rate of about 25 gallons an hour at a maximum load of 315 kw. Its fuel tank holds 260 gal. lons and can be refilled without stopping the engine. Actually, the engine can operate on a wide range of fuel oils, so that the local supplies on hand would be adequate. For 24-hour operation on a 315-kw load, the unit requires 11½ barrels of fuel oil.

The engine is air-cooled. Both side panels of the trailer open to admit air to the engine and to provide walkways as well as access to the engine. A giant fan at the back of the trailer draws air through the radiator at the rate of about 2½ tons per hour of operation.

The exhaust from the engine is expelled through two pipes at the rear of the trailer. Two residential-type mufflers reduce engine noise to a minimum. All accessories necessary to the operation of the unit are carried aboard the trailer.

Pistol-Type Torch

A new automatic acetylene-air gas torch is made by Velocity Power Tool Co., 7505 Thomas Blvd., Pittsburgh 8, Pa. The pistol-shaped Torch-O-Matic lights at a squeeze of the trigger and shuts off upon release, thus eliminating separate operation and equipment for relighting, manual valve adjustment, pumping or priming, and warmup. It is said to be especially well suited for intermittent or on-again-off-again work. Squeezing the spring-loaded trigger simultaneously opens the torch gas valve and sparks the heavy-duty flint for ignition. The trigger can also be locked open for a continuous flame. One-hand operation is said to give better user comfort and efficiency.

The Torch-O-Matic weighs 12 ounces and provides instantaneous heat up to

Squeeze the Torch-O-Matic and it produces an acetylene flame up to 2,800 degrees. The 12-ounce pistol-shaped torch is handy for a variety of work.

2,800 degrees. Combustion tubes available in three sizes, 1/8, 3/16, and ¼-inch, permit the use of the torch for any air-acetylene job—from heavy soldering or heating to the finest precision work, the company says. Accessories include a pressure regulator, with either MC or B tank coupling; tank and operating-pressure gages; hose and hose clamps; lighting flints; combustion tubes and nozzles; and extension tips.

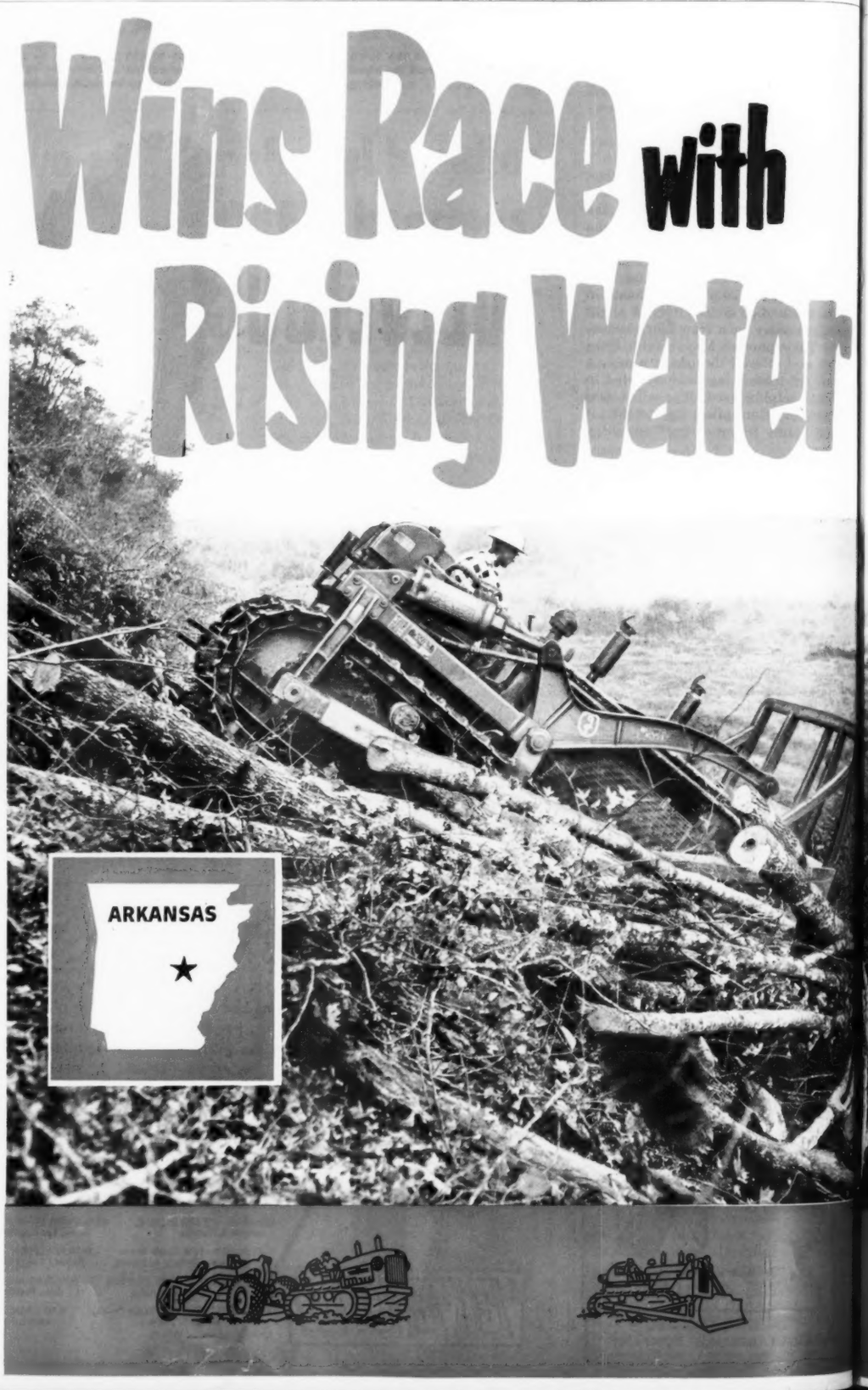
Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 576.

Bulletin on Excavator

A 40-page bulletin on the P&H 2½-yard excavator has been prepared by Harnischfeger Corp., 4400 W. National Ave., Milwaukee 46, Wis. It contains many over-all photographs of the Model 955-A working on projects throughout the country; closeups emphasize the features of the "rock-rated" excavator. Special mention is made of P&H's exclusive Magnetorque swing with its speed, smoothness, and reduction of maintenance.

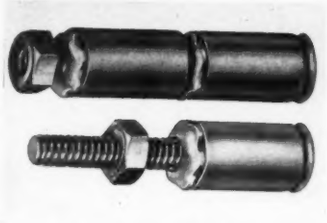
The excavator converts easily to service as a shovel, dragline, clamshell, or crane, because the split-sprocket and drum-lagging arrangement eliminates the need for auxiliary shafts, gears and sprockets. For heavy-duty crane work, the 955-A has lifting capacities up to 60 tons with maximum safety while as a shovel the model is particularly adaptable for tough rock-removal jobs, the company claims.

This literature may be obtained from the company by requesting Bulletin X122-1, or by using the Request Card that is bound in this issue at page 16 Circle No. 573.



Anchor-Bolt Assembly

New single and double anchor-bolt assemblies have been developed by Super-Grip Anchor Bolt Co., Inc., 3333 N. 22nd Street, Philadelphia 40, Pa. After the anchor bolt, lead sleeve, and cup-shaped steel anchor are inserted, a tamping tool mushrooms the lead. Repeated blows flatten out the steel anchor, driving its ribbed-steel edges into the walls of the hole. Steel reinforces the lead and provides a permanent, solid anchorage to prevent bolts from loosening.



The new Super-Grip anchor-bolt assembly comes in bolt sizes from 3/16 to ½ inch and up to 5 inches long.

The anchor can be put in masonry, brick, wood, etc., at any angle, and the bolt can then be bent or off-set without disturbing the anchorage. Single or double anchor-bolt assemblies can be obtained in bolt sizes from 3/16 to ½ inch and up to 5 inches long. A tamping tool is provided free with every 100 assemblies.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 555.

Emulsified Asphalt For Road Surfacing

Increased interest in the use of emulsified asphalt for highway construction was manifested at the last meeting of the Southeastern Association of State Highway Officials. Something of a new trend appears to be under way in the use of this bituminous material in the economical building of roads. In papers and discussions at the meeting, the versatility and durability of emulsified asphalt were emphasized, together with its economic features.

Some specific examples of where and how emulsified asphalt has been employed in the southeast were summed up recently by Thomas L. Hodges, District Manager of American Bitumuls & Asphalt Co., San Francisco, Calif. In Louisiana, according to Mr. Hodges, a mixture of crushed shells and emulsified asphalt has been used as an emergency stopgap measure in road surfacing. Some stretches of concrete pavement, built in the early 1930's on unstable swamp and marsh soil, were disintegrating and badly in need of repairs.

At the time, hot plant-mix materials for a new surface were not available. Accordingly clam and dead reef shells that are cheap and abundant in that locality were shipped to the site. They were crushed and combined near the job, then mixed with emulsified asphalt, using the conventional bituminous distributors and motor graders. The road-mix processing was carried on despite heavy traffic and rainy weather.

As to the versatility of emulsified asphalt, Mr. Hodges stated that it may be used as a dust palliative (diluted with water); mixed with sand, shell, or sand-gravel for surface-treatment and seal-coat work; used as an overlay for badly crushed concrete pavements, or as a sandwich course on pavements which must support heavier loads than they were designed to accommodate; and as a crack filler.

Mixtures of emulsified asphalt may be stockpiled for months at a time, or even left in windrows over the winter for use the next season. Since the material may be used in rainy weather, or with wet or damp aggregate, no drying equipment is necessary. Emulsified asphalt is unloaded from tank cars and applied at atmospheric temperatures, thus eliminating the cost of heating equipment and supplemental fuel.

As for surface-treatment and seal-coat work, Mr. Hodges declared that the prime advantage of emulsified asphalt lies in its increased life expectancy. This, he said, is due to the use of a softer asphalt of 150-200 penetration in its manufacture. Softer asphalt, being more resistant to oxidation, accounts for the material's greater retention of cover aggregate with a minimum of "bleeding".

Team of IH crawlers clears reservoir in the mountains while White River backs up behind Bull Shoals Dam

The minute they closed the new Bull Shoals Dam on Arkansas' White River, water started backing up over ground still covered with trees and brush. It had to be cleared and cleared fast, and one of the crews on the big job was Patton Construction Co.

Patton tackled the steep, overgrown slopes with 150 men and six International crawlers ranging from TD-18A's down to a TD-9. Each crawler averaged 10 acres cleared a day—*"remarkable, in this rough Ozark Mountain country,"* says Tractor Foreman Hallie Goldsmitt.

And operator W. W. Sloane, adds, *"We go up these mountainsides forwards, backwards or sideways—but we go up somehow and we get the job done because these Internationals have the power."*

Ask your International Industrial Distributor today for details on the whole International line of rugged red crawlers. Ask about his service, too—and his complete stock of spare parts for any emergency. Get all the answers—and put International "Power that Pays" to work for you!

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

SEE YOU AT THE POLLS!

INTERNATIONAL HARVESTER

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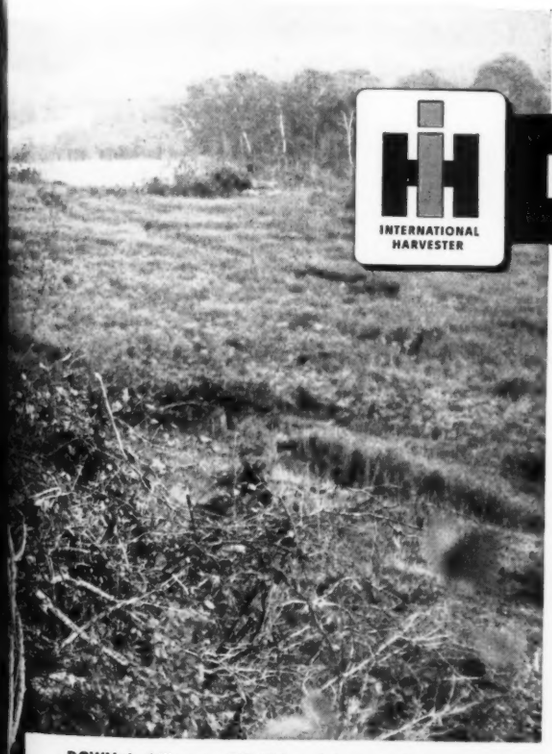
POWER THAT PAYS



DOWN the hill goes a TD-18A, and down go the trees that stand in its way. International crawlers have what it takes, both in sheer dogged power and rugged reliability.

UP comes another TD-18A, hitting fast and hard on a job where speed counts in beating the rising waters backing up behind the dam to create a new reservoir.

Line of Diamond Drill Bits

A catalog on diamond drill bits has been released by Sprague & Henwood, Inc., Scranton, Pa. It illustrates and describes the main features of coring and non-coring bits, casing bits, reaming shells, and drilling rigs.

The company standard Trucast bits for average drilling conditions use a matrix metal of copper and beryllium alloy. For work in very abrasive rock or ore, the company recommends its Trucast H of nickel and beryllium. Extremely tough rock requires the tungsten-alloy Tufset and Rossset bits.

This literature may be obtained from the company by requesting Bulletin No. 320, or by using the Request Card at page 16. Circle No. 599.

This special tower was assembled for Chain Belt Co. from standard Safway scaffold frames. It supports a pipe through which Rex Pumpcretes, in tests, shoot concrete 100 feet up into the clouds. The tower proves that this freight can be pumped with an adequate factor of safety.

Service Is the Key To Dealer's Success

Tennessee Dealership Accents Service in Its Organization; Efficient Plant Layout Provides One Means

• THERE are many things that contribute to an equipment distributor's success. Among them, service ranks very high on the list. The middle-Tennessee area has a dealer that has keyed its entire organization to that end. Thompson & Green Machinery Co., Inc., Nashville, provides its customers with a never-ending dependable service.

The Formula for Success

The company is a big one now, but it wasn't always. As a matter of fact it's really a youngster in the business. It was first formed as a partnership in 1944. The principals of the firm had long experience handling the GMC truck account in Davidson County. However, this was their first step into the construction-equipment field. They built the new business the same way they had the old—with a solid *service* foundation. The GMC dealership continues as a most active business, operated as an entirely independent company with separate management and personnel.

Thompson & Green Machinery Co. started out with 12 people. The original location was not adequate for the growing firm and in 1945 a new modern plant was constructed a mile south of Nashville on U. S. 41.

Ninety people work with T&G now. Employer-employee relationship is excellent. Management clearly recognizes and highly evaluates the worth of each individual employee. The department managers, as well as all employees, participate in profits through yearly bonuses. Excellent working conditions and company-supported group activities give an esprit de corps that carries over into customer relations.

One of the other things that has contributed to the success of the company is its decision to handle a limited number of lines with unlimited service. As the company grew, the main equipment lines accounted for an increasing percentage of its business. The young organization soon realized that the interest of its customers and the manufacturer could best be served by limiting the number of accounts carried. In this way the salesmen were able to concentrate on specific needs of the customer and were in a better position to recommend the right unit to do the job. The Parts Department could increase its stock, insuring an adequate inventory at all times. And the shop mechanics became "factory specialists" servicing these machines. The benefits were across the board.

Thompson & Green carries three main accounts: Caterpillar and its allied lines—Trackson, Hyster, Athey, Rome Plow, and Fleco; Thew Shovel; and Gardner-Denver. The quality of these machines and the support of the manufacturers have assisted the firm in its growth.

In Thompson & Green's yard, outside the shop bays, a Thew-Lorain 20 shovel comes off a Phelan low-bed trailer. Note the outside hoists.

Distributor Doings

Modern Shop Layout

The modern T&G shop was designed by J. O. Hardison, Service Manager. The neat clean lines and simple arrangement of the servicing equipment make it ideal for working. The service area is 100 feet long and 80 feet wide. There are ten work bays, five on each side, each with its own entrance door. This makes the entire shop accessible from any point. The big units just roll right in or out of the service stalls. There are no worries about other equipment being in the way. In the summer all doors are rolled up. The cross-ventilation keeps the shop at a comfortable working temperature. In the winter the doors are closed and space heaters turned on.

Pulling out a heavy machine assembly is no problem in this shop. Self-supporting jib cranes set between each of the stalls do the job very nicely. These were designed by Mr. Hardison and made up in the T&G shop. They have a cylindrical steel base with a rotating horizontal jib to serve the stall on either side. Each jib carries a track-mounted 3-ton Wright chain hoist. The heavy assembly is easily lifted, pulled aside, and swung over to a clear working area. At the back of the shop there is an extra unit carrying a 1-ton Budgit electric hoist. This works around the Rodgers track press and two 50-ton vertical presses. Portable parts benches in the shop assist the Mechanics and Parts Department personnel in proper identification and placement of all requisitioned items.

The shop itself is completely equipped with servicing machinery. Following are the main items:

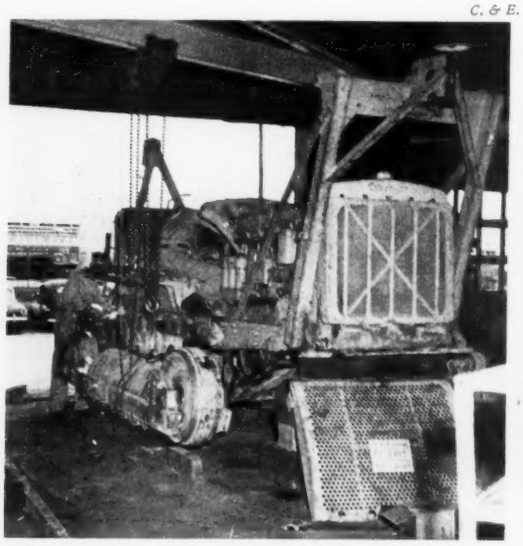
Torchweld portable acetylene welders
Hollup portable ac arc welders
Sioux heavy-duty grinders
Black & Decker 7-inch flexible disk sanders
Walker-Turner drill presses
Caterpillar 50-ton portable service presses
Sioux valve-face grinders
Alemite low-pressure grease pumps

Up at the front there is a dust-control room where diesel fuel-injection systems are checked and completely rebuilt if necessary.

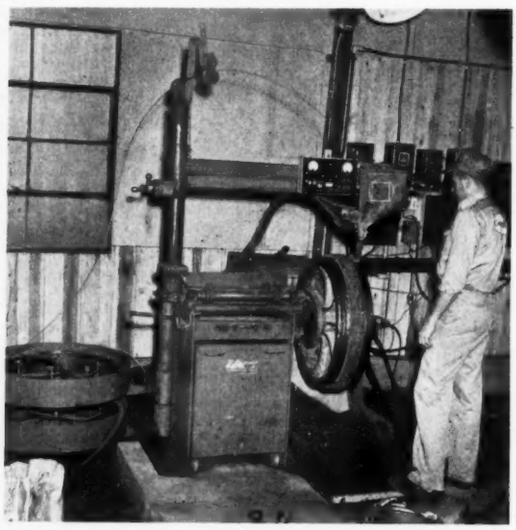
There are three smaller buildings beside the main shop and office—a steam-cleaning and spray-painting shop, a welding shop, and a warehouse for large stock items.

The feature of the welding shop is the recently installed Leader automatic electric welder. This unit hard-faces

C. & E. M. Photos



T&G servicemen strip down a Caterpillar D8 prior to rebuilding the final drives. A self-supporting jib crane is a help.



Feature of the welding shop is the recently installed Leader automatic welder; it is called on for plenty of hard-facing.

With simple adjustment, this rack in the Parts Department will carry any size and number of rollers desired.

In the rear of the shop, a couple of T&G workmen—2 out of the 90 people this firm employs—use a Rodgers track press.

cylindrical track rollers and idlers in sizes from 6 to 48 inches in diameter. It can add ⅛ to 3/16 inch of weld with each pass at a surface speed of 28 to 30 inches per minute. Thompson & Green uses a Stoody 5/32-inch rod that comes in 100-pound reels for most of the hard-facing work—along with this, a Union-melt welding compound to keep the arc submerged at all times. The success of the new welding service is testified by T&G customers. The welding shop is also outfitted with Wilson Bumble-bee arc welders and a Rodgers No. 40 hydraulic press.

Concrete-Paved Yard

Thompson & Green has plenty of yard room for its large stock of equipment. There are five acres of ground; 40,000 square feet of this is paved with concrete. The outside loading ramp, running the full length of the shop and Parts-Supply Department, is sloped. Trucks can move in at the right loading height for fast and easy transfer of equipment. There are three Wright 3-ton hoists and a Caterpillar diesel 50 tractor with a tail-mounted A-frame to handle the outside lifting work.

Fast Parts Delivery

In this outfit the Parts Department doesn't take second place to the shop or sales end of the business. Lewis Mathes, Parts Manager, keeps his department at top-drawer efficiency. And that can be taken literally, too. During 1951, 92.4 per cent of all parts orders were taken right from stock—this in a year which was considered to be pretty tough for parts availability.

The Parts Department consists of about one-third of the main building. Over 15,000 items are kept in stock for the main lines handled by T&G and all are recorded on a Kardex perpetual inventory file, insuring good parts availability at all times.

Personnel

Officers of the firm are DeWitt C. Thompson, Jr., President; George M. Green, Jr., Vice President; and DeWitt C. Thompson, III, Secretary-Treasurer and General Manager. William H. Smith is the Sales Manager, ably supported by Edward S. Kelly, Assistant Sales Manager. The territory is covered by five aggressive sales representatives. Promotional activities are supplemented by the Charles Coggin Advertising Agency of Nashville.

C. & E. M. Photo

Some hand welding goes on in the Thompson & Green shop.

At present writing T&G has application with NPA for authority to increase the plant facilities from 30,000 to 50,000 square feet of enclosed building. This increase is occasioned by the demands of contractors who are engaged on large projects associated with national defense in the T&G territory.

Dealers — send in your news!

Southern Distributors for A-C

Two new southern distributors have been named by Allis-Chalmers Mfg. Co., Milwaukee, Wis.

E. C. Blackstone Co., 600 Madison Ave., Memphis, Tenn., has been appointed a dealer for Allis-Chalmers motors, controls, pumps, transformers, and Texrope drive equipment, in portions of Tennessee, Mississippi, Kentucky, Missouri, and Arkansas.

The distributor for A-C motors and controls in Arlington and Fairfax Counties, Va., will be the Eugene W. Zimmerman Co., 500 N. Fayette St., Alexandria, Va.

Clipper V. P. Forms New Co.

Robert G. Evans, one of the original founders and Vice President of Clipper Mfg. Co., Kansas City, Mo., manufacturer of portable saw rigs and saw guides, has formed a new company to distribute masonry and concrete sawing equipment. The company, Robert G. Evans Co., 6315 Brookside Plaza, Kan-

(Continued on next page)

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. . . . best for your tarps, covers, windbreaks

RESISTS WATER . . . plus FLAME MILDEW WEATHER

Approved by the Underwriters' Laboratories, New York Bureau of Standards and California Fire Marshall. Meets or exceeds all FTC requirements.

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PHILADELPHIA TEXTILE FINISHERS Incorporated 104 Lafayette St. Norristown, Pa.

Diamond Roller Chains, of Course!

The primary drive from engine is 8-strand Diamond Roller Chain with 2- and 3-strand Diamonds from countershaft.

Model 4500 Manitowoc Speed-Crane Dragline on stripping operation.

ON EXCAVATORS OF HUGE CAPACITY

● The bigger the dragline, shovel or crane, — the greater the need for continuous, uninterrupted operation. Delays are extremely costly where investment is so great.

It is a well recognized fact that Diamond Roller Chains are regularly chosen above all others because of their uniform long-life reliability, extra reserve strength, and maintained high efficiency of power transfer . . . On the big Manitowocs, 8-strand Diamond Roller Chains are the primary drives with 2- and 3-strand drives from countershafts.

For original equipment and replacement, the Roller Chain with the identifying "diamond" on every link is your assurance of maximum performance.

DIAMOND CHAIN COMPANY, Inc.
Dept. 487, 402 Kentucky Avenue, Indianapolis 7, Ind.
Offices and Distributors in All Principal Cities
Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS

Distributor Doings

(Continued from preceding page)

sas City, Mo., will market Target blades, which will be identified by colors instead of complex symbols.

Mr. Evans, a nationally recognized figure in the field of Diamond blade research and development, is an authority on blade specifications as well as all types of cutting equipment and machinery.

New Link-Belt Speeder Dealer

Link-Belt Speeder Corp., Chicago, Ill., has announced the appointment of Spreitzer, Inc., Cedar Rapids, Mich., as distributor for Link-Belt Speeder Shovel-Cranes in southeastern Iowa and northwestern Illinois. The company will represent the manufacturer in the following counties: Iowa—Dubuque, Tama, Buchanan, Keokuk, Davis, Delaware, Blackhawk, Poweshiek, Iowa, Linn, Benton, Jones, Jackson, Johnson, Cedar, Clinton, Mahaska, Muscatine, Louisa, Washington, Jefferson, Des Moines, Van Buren, Lee, and Wapello; Illinois—Rock Island, Whiteside, Henderson, Hancock, Henry, Mercer, Warren, and McDonough.

Spreitzer will continue to be at 533 First St. until the completion of its new, larger headquarters. Harry Spreitzer heads the company, with Charles Quinn as Parts and Service Manager.

Cleco's Three Latest

Three distributors have joined the roster of the Cleco Division of the Reed Roller Bit Co., Houston, Texas. They are: Oliver H. Van Horn Co., 1742 St. Charles Ave., New Orleans 1, La.; Bethlehem Supply Co., Inc., Bethlehem, Pa.; and Peerless Supply Co., Inc., Shreveport, La. All these firms will handle the Cleco and Dallett lines of air tools and accessories.

S. M. Hunter, left, new Sales Manager of W. H. Anderson Co., Detroit, Mich. At right, Edward A. Hunt, Anderson's new Vice President in charge of the Euclid Division.

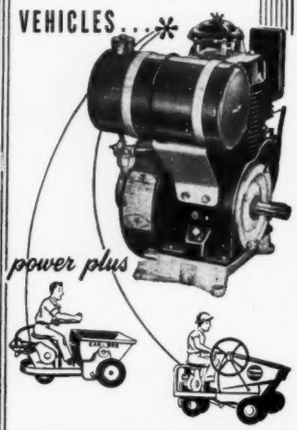
W. H. Anderson Sales Executives

S. M. Hunter, former Vice President of American Hoist & Derrick Co., St. Paul, Minn., has joined W. H. Anderson Co., Detroit, Mich., construction-equipment distributor, as Sales Manager. Edward A. Hunt becomes Vice President in Charge of the Euclid Division.

Cummins Sales & Service Promotes

Cummins Sales & Service, Inc., Fort Worth, Texas, distributor of Cummins

GLADDEN ENGINES NOW OPERATING OVER 3000 MATERIAL HANDLING VEHICLES...*

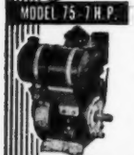


AN OUTSTANDING RECORD OF TROUBLE-FREE PERFORMANCE

"We are using Gladden engines exclusively on our material handling units because of their universally accepted dependability and powerful performance," says the Vice-President of one of the leading manufacturers of material handling units.

Strong, reliable and inexpensive to operate, GLADDEN'S series of single cylinder, air-cooled, pretested engines find real usefulness in every construction application.

MODEL 75-7 H.P.



FEATURES OF DESIGN

Timken Main Bearings

Automotive Type Connecting Rod Bearing Inserts (Models 50 & 75)

Meehanite Cylinder Castings

Pressure Cast Aluminum Head

MODEL 50-5 H.P.

Oil Bath Air Cleaner as Standard Equipment (Models 50 & 75—Optional 40)

Generous Fin Area Insures Maximum Cooling

GLADDEN ENGINEERS WILL ADAPT THESE ENGINES TO SPECIAL INSTALLATIONS OR REQUIREMENTS UPON REQUEST...

MODEL 40-4 H.P.

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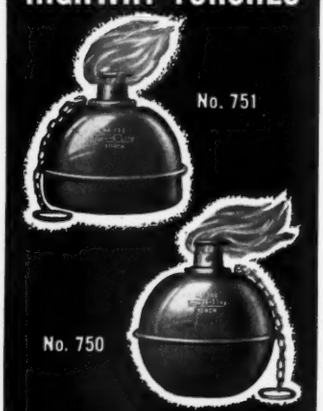
NOW IN THE 33rd YEAR OF ENGINE BUILDING

685, Dept. 100, West Colorado Boulevard Glendale 4, California

EMBURY offers *Protection Plus!*

Luck-E-Lite HIGHWAY TORCHES



- Weather Guard Burner—stays lighted
- Cam-Lock Burner Hood—no threads to strip
- Easy to Fill
- Ring Chain—for easy carrying and placing
- Two models—Flat base or self-righting

For more Luck-E-Lite facts and nearest distributor, Write

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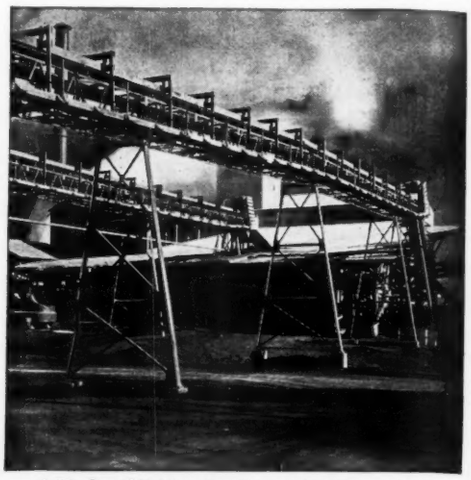

A "Packaged Unit" to Meet Your Belt Conveyor Needs

The HEWITT-ROBINS SECTIONAL BELT CONVEYOR

Easy to Assemble *Pre-Engineered* *Strongly Constructed*

Here is the complete belt conveyor that will meet the requirements of both small and large operators handling bulk materials.

Easy to Assemble: Your own men can assemble, disassemble, move, extend or shorten it quickly and easily.

Take Your Choice: Select the right belt conveyor to fit your own particular needs—you have a choice of 3 types of drives—wide selection of intermediate truss lengths—your choice of idlers—(4", 5" or 6" diam.)—4 belt widths (18", 24", 30" or 36") in lengths up to belting limitations.

Factory-Assembled Units: All truss side members are factory-welded as complete units and are jig-drilled for easy erection—head and tail units completely assembled with machinery in place.

Standard Equipment: Self-cleaning, protective decking for return strand supplied for the entire conveyor line.

Optional Equipment: Hood covers—easily attached loading hopper.

Only Hewitt-Robins is able to take single unified responsibility for a belt conveyor installation—only Hewitt-Robins manufactures both machinery and belt.

Get the complete story. Write for Bulletin No. 132-A.

HEWITT-ROBINS INCORPORATED
STAMFORD CONNECTICUT

Hewitt Rubber Division
Hewitt Restfoam® Division
Robins Conveyors Division
Robins Engineers Division

This Allis-Chalmers HD-9B tractor with the new 9X Baker hydraulic bulldozer was the first of its kind delivered in North Carolina. E. F. Craven Co., Greensboro, N. C., sold it to William Muirhead Construction Co., Durham, N. C. The entire tractor moves up and down with the blade, which has a 37-inch lift.

diesel engines and portable electric generators has promoted J. L. Peeler to the post of Director of Purchases. Peeler, with Cummins since 1946, was formerly Assistant Purchasing Agent.

G. J. Van Dyke has been appointed District Service Manager at Pharr, Texas.

B-E Appoints Two New Distributors

Two new distributors have been appointed by Bucyrus-Erie Co., S. Milwaukee, Wis. Richardson Tractor Co., 601 50th St., Kanawha City, Charleston, W. Va., will distribute in West Virginia, except in the panhandle counties of Hancock, Brooke, Ohio, and Marshall, and in the three Maryland counties of Garrett, Allegany, and Washington. The Border Machinery Co., 1710 E. Paisano Drive, El Paso, Texas, will cover the seven New Mexico counties of Grant, Hidalgo, Luna, Dona Ana, Otero, Eddy, and Lea, and the nine Texas counties of El Paso, Hudspeth, Culberson, Reeves, Pecos, Jeff Davis, Presidio, Brewster, and Terrell.

Both companies will handle the B-E ⅜ to 4-yard gasoline, diesel, and electric-motor convertible excavators; the Hydrocrane; the Hydrohoe; and Red Arch dragline buckets.

Southern Distributor for Waco

Wilson-Albrecht Co., Inc., Minneapolis Minn., has appointed Billingsley Floor & Blind Co., 207 S. Cooper, Memphis, Tenn., a dealer for Waco sectional-steel scaffolding in eastern Arkansas, northern Mississippi, and western Tennessee. A separate division will handle the complete line of company scaffolding, mason and scaffold jacks, material-hoisting towers, and portable elevators on a rental and sales basis.

Chicago Sales Co. Expands

Increased facilities for staff and stocks are provided by a new store opened by Syntron Chicago Sales Co., representative and distributor for Syntron Co., Homer City, Pa., manufacturer of vibratory material-handling equipment, power tools, selenium rectifiers, shaft seals, etc. The new site affords ample room for carrying stocks of equipment and providing local service on Syntron power tools. The store is located at 236 N. Crawford Ave., Chicago.

Oklahoma Distributor Expands

Ball Distributing & Engineering Co., Tulsa, Okla., has opened a new branch at 819 N. Olie St., Oklahoma City, Okla. The company distributes the Ultralite glass-fiber insulation manufactured by Gustin-Bacon Mfg. Co., Kansas City, Mo. Glenn Hughes, Vice President of Ball, is in charge of the new branch.

Line of Couplings

A line of standard-bore couplings for worm shafts, gear shafts, and electric-motor shafts is announced by Cone-Drive Gears Division, Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

Cone-Drive flexible couplings are the gear type with seven parts: a sleeve, two hubs, two Neoprene seals, and two snap rings. They are said to be easily disassembled and sealed to keep weather out and lubrication in. The hubs and sleeve are SAE 1045 steel forgings with 90,000-psi tensile strength. The couplings allow an average of 3 degrees angular misalignment and 1/16 inch offset, depending on size.

The standard couplings are made in 22 bore sizes from ¾ to 6½-inch diameters with capacities from 4 to 550 hp. Other Cone-Drive couplings, including mill-motor, spacer, vertical-shaft, and floating-shaft types, can also be had in bore sizes from ⅜ to 6⅝-inch diameters.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 587.

Powered-Wheelbarrow Data

Literature describing a powered wheelbarrow has been released by Prime Mover Co., Sampson St., Muscatine, Iowa. It illustrates how the Prime-Mover turns in its own length, clears narrow doorways, mounts inclines, and handles material.

The unit features direct drive forward and half-speed reverse. It is powered by a 5-hp Wisconsin engine. The foot-operated load-dumping control empties the 10-cubic-foot bucket which returns automatically to load position. The Prime-Mover hauls up to 1,500 pounds and turns in a 33-inch radius.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 597.

Fleming Moves Its Plant

The sales office and production plant of Fleming Mfg. Co., St. Louis, Mo., manufacturer of concrete-handling equipment, recently went into new quarters at Cuba, Mo. The company's executive office is at St. Louis.

The new plant, which started production last June, consists of four one-story buildings, occupying an area of about 20,000 square feet. Tilden A. Donihee is Plant Manager, and will combine this job with those of Sales Manager and Secretary. Shop Superintendent is Arthur Cleary, and Chief of Design is Omar Jaspering.

The fastest Paving Breakers in their class . . .

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The Reed-Cleco Valve, found only in Cleco Paving Breakers, gives full control of both power and return strokes, reducing recoil.

Cleco Paving Breakers hit hard and fast. They produce more work per man per hour and cost less to maintain than any other demolition tools in their class.

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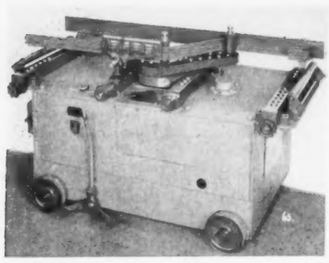
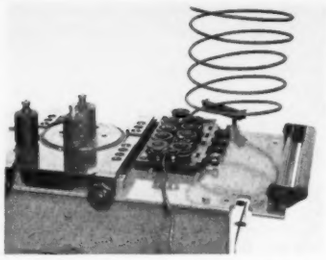




The Klingelhofer machine will bend reinforcing bars from 1¼ to 2 inches in diameter. At left it does multiple double bending. At right, a special attachment bends a spiral. The unit is available in 3 models.

Bar-Bending Machine

A machine for bending reinforcing bars is offered by Klingelhofer Machine Co., Industrial Park, Kenilworth, N. J. The unit comes in 3 models with bar-bending capacities up to 1¼, 1 9/16, and 2 inches. It will bend hooks and angles on one or more bars at a time, two angles in one operation, or alternate right and left angles. Bars always move across in one direction.

A special attachment will bend spirals, rings, and curves of any diameter and pitch. Another device bends from 600 to 800 stirrups per hour, depending on the model.

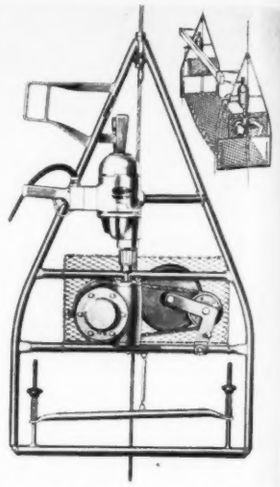
The machine is made of high-tensile steel plates, is totally enclosed for protection of all moving parts from dirt and the elements, and is mounted on heavy casters for ease in moving from job to job. Adjustments for hook and angle bends are made by a hand wheel located between supporting rails. The unit is powered by a 2, 3, or 5-hp ac motor, depending on the model.

Further information may be secured from the company. Or use the Request Card at page 15. Circle No. 613.

New Powered Stirrup

An all-metal stirrup for swing scaffolds, powered by a heavy-duty electric drill, has been introduced by Bil-Jax, Inc., Archbold, Ohio. Built around a worm gear and pinion that will not move in either direction unless power is applied, it can lift 700 pounds and travel about 16 feet per minute. The cable does not wind onto a drum.

The stirrup accommodates staging up to 24 inches wide. Seventy-five feet of ⅜-inch steel cable is furnished with each stirrup. A safety clamp at the upper ferrule is automatically actuated to prevent accidental descent, and a bracket for the guardrail is also provided. The electric drill furnished is quickly removable for use on the job if desired.



A heavy-duty electric drill powers this all-metal stirrup for swing scaffolds.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 556.

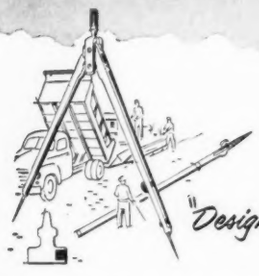
Tractor Service-Tool Manual

A 12-page bulletin with complete information on tools for servicing International tractors is announced by Owatonna Tool Co., 381 N. Cedar St., Owatonna, Minn. Both manual and hydraulically operated pulling tools are shown with attachments and accessories for use with the Power-Twin hydraulic puller. Also illustrated is a conversion set with which manually operated sets now in use may be converted to hydraulic power.

The tools are used for all pulling and installing operations on International wheel tractors, involving bearings, gears, bearing outer races, couplings, pinions, pulleys, wheels, sleeves, and other close-fitting parts. Included also are several pages showing these service tools in action.

This literature may be obtained from the company, or by using the Request card that is bound in at page 16. Circle No. 646.

use MARION BODIES AND HOISTS dump trailers for haulage efficiency



"Designed on the Job"

Many Marion owners are purchasing additional Marion Dump Trailers. These owners know the extra benefits that can be expected from Marion equipment.

They know that these benefits mean dollars saved . . . because of greater load-carrying capacities, less maintenance cost and fewer man-hours per-ton payload.

Marion all-welded Trailer Bodies are constructed to withstand sagging or twisting when loads are uneven or extra heavy. Marion's Heavy-Duty Hoists operate with extremely low, even oil pressures . . . without high-surge points during any part of the lift.

Marion Hoists are specially designed to provide load stability throughout the dumping cycle . . . thus reducing the possibility of overturning when operating under adverse conditions.

Marion's "Designed on the Job" Dump Trailers and heavy-duty hoists have the built-in endurance that insures a dependable, performance-plus operation.

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NOW! BUCK gives you the *only complete* automatically-portable heavy-duty HOISTING MACHINE in the world!

Set up and ready to operate in less than 25-minutes . . . instead of hours!

Ready - rigged, self-erecting tower. Self-erecting to 40-feet, additional sections may be added if needed.

Wheels retract *automatically* when tower goes up . . . return to towing position when tower is lowered.

Raises 2000-pound load at rate of 100 feet per minute.

Pneumatic trailer mounted . . . finger-tip balance. Easily towed by pick-up truck.

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Ask Yourself This: Can I Afford to Die?

Estate Taxes, Unforeseen Expenses Can Reduce Savings; Plan Now for Estate Conservation

By K. KAUFFMAN-GRINSTEAD
As told to ERNEST W. FAIR

• "I'M all set now. . . . I've made enough to take care of my wife and family in the style to which they are accustomed and it's all safely invested to assure them a good income for life."

How many business men have made that statement this very day? The chances are the reader has heard it any number of times right in his own circle of business acquaintances during the last few weeks. Chances are, too, that in at least 19 out of 20 cases the speaker is entirely wrong. To leave an estate large enough to take care of your wife and see your youngsters safely on their way takes a lot more than mere accumulation of wealth. Far too often this is only the start.

The Invisible Mortgage

There's an invisible mortgage hanging over the estate of every contractor and engineer who reads these pages. There are pitfalls in estate shrinkage that only an expert can foresee. The dangers of inflation are very real and may defeat one's whole purpose. The unforeseen things that can happen are unfortunately far too numerous to be ignored.

First, and extremely important, is the terrible toll of taxes. Today we have to worry about income taxes during our lifetime *and* about estate taxes after our death. Then, the expenses of our last illness, which most of us never consider, can be a sudden and damaging blow to our estate. These, and many other things, make it doubtful whether some of us can really afford to die unless we have done some expert estate planning. The invisible mortgage on everything we own becomes due and payable immediately. It is the sum of the cash obligations which become due at our death.

Many of us suppose we have a well balanced estate with enough cash to take care of any emergency that may arise at our death. Yet other men have been fooled. The record books are full of instances. An outstanding case was that of Frank Knox, Secretary of the Navy and publisher of "The Chicago Daily News". His estate provided insufficient cash to pay the taxes and all the other unexpected bills, and in order to meet these obligations his widow had to sell, at a great sacrifice in value, the one possession he had hoped to pass along. Another was Frederick C. Gruen, the distinguished jewelry manufacturer, who left a gross estate of $194,272 yet only $318 in cash with which to meet obligations that ran into the thousands.

Some Common Mistakes

There are thirteen expensive mistakes commonly made in estate planning. If these are avoided you can save your family one-quarter to one-third of your life-time savings. Before listing these mistakes, however, it is well to point out that the problems of one estate are entirely different from those of another. These thirteen are merely those that recur most often.

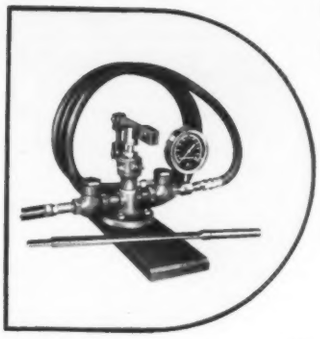
1. Never underestimate the value of your taxable estate. Recently an accountant said, "As long as the value of your estate is not greater than $120,000, there is no Federal estate tax." This information is only half correct, for your estate may very well have to pay a whopping big tax if its value is greater than $60,000. Too many of us underestimate what we are really worth from this standpoint. For tax purposes your estate may include the following:

Cash owned by you; cash owned by another person but belonging to you; all bank accounts in your name; some or all of the bank accounts in your name jointly with another person; the maturity value of insurance on your life for which you paid premiums either directly or indirectly; some or all of the

(*Continued on next page*)

DUDGEON HYDROSTATIC TEST PUMPS

FOR DEPENDABLE PERFORMANCE



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Solid bronze body • stainless steel piston • swivel ring permitting operation from any position • large check valves with non-corrosive seats • 6" dial gauge • removable lever • 24 foot discharge hose • 10 foot suction hose.

STOCKED for the following capacities:

	Test Pressure P.S.I. Max.	Piston Diam.	Check Valves	Discharge Hose
A	200—2000	1"	1"	1"
B	2000—3400	¾"	1"	1"
C	3400—4000	¾"	¾"	½"
D	4000—6000	¾"	¾"	¼"

OTHER PRODUCTS:
- Heavy-duty hydraulic Jacks for tension and compression.
- High pressure hydraulic Pumps.
- Special hydraulic units.

MODEL No. 2. For pressures to 1000 psi • fixed lever and linkage • ¾" valves.
MODEL No. 3. For pressures to 300 psi. • ¼" valves.
(When ordering specify test pressure)

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Here's an efficient, dependable set-up for a job requiring 1200 cubic feet of air a minute — two CP Model 600 Diesel-driven PORTABLE AIR COMPRESSORS.

Whenever less air is needed, however, the CP Gradual Speed Regulator takes care of smaller demands by reducing engine speed proportionately, minimizing wear and maintaining peak economy.

The wide range of CP time-tested gasoline and Diesel-driven Portable Compressors — from 60 c.f.m. to 600 c.f.m. — permits the selection of the most suitable equipment for any particular kind of job.

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Fiftieth ANNIVERSARY

Ask Yourself This: Can I Afford to Die?

(*Continued from preceding page*)

value of insurance on the life of another person for which you pay premiums; maturity value of accident insurance; market value of bonds and stocks held singly or jointly; taxable value of business interests owned individually or jointly; value of real property owned singly or jointly; value of royalties and mortgages; all property in your home; value of property given to another person even if gift tax was paid; value of future rights which you may receive as a gift; value of any property or rights you may receive from trusts or inheritance; value of future savings from investment income; value of capital gains on present or future assets, and similar items.

One of the biggest mistakes made today is to believe that man's joint ownership of bonds or stocks with his wife subjects them to taxation on only one-half of their value. In 99 cases out of 100, Uncle Sam puts the full value into the estate, and that's true of real estate, bank accounts, etc. Figuring real estate and other assets at prices we paid for them is also wrong . . . the value Uncle Sam figures on is their present market value. Appraising one's business at book value won't be accepted either . . . just ask, "If I wanted to sell this contracting business today, what would be a fair asking price?" and the answer will be the tax answer.

2. The second big mistake is to underestimate the death taxes on your estate. An estimate made on the basis of today's considerations is never safe. Today's $60,000 level may become $30,000 at the next session of Congress.

3. To underestimate the other cash obligations of your estate is a third big mistake. This includes all amounts which have to be paid by the estate independently from and in addition to death taxes. Examples: expenses of the last illness (and they may be great); cost of funeral; compensation of an administrator or executor; fees for attorneys and accountants and appraisers; court expenses; accrued income taxes; tax deficiencies for past years; unpaid bills; and selling expenses for the liquidation of assets which must be sold to raise the cash for meeting such obligations. Between 10 and 20 per cent of the gross estate should be allowed when reckoning general cash obligations other than death taxes.

4. Mistake No. 4 is to overlook the danger of forced sales and liquidation losses. One contractor left an estate of $92,587 gross obligations and but $28,807 to pay them. A Dayton business man left an estate with $28,222 cash to pay what turned out to be $107,529 in obligations. Thousands of such cases are in the public records. When we have obtained a realistic estimate of our estate's taxable value and add this to the foregoing general cash obligations, we will generally find these reach a considerable figure. If part of our estate must be sold to meet these obligations it can seldom bring a fair price, because all buyers know it is being put up under forced sale. When that happens a well planned estate can shrink dangerously.

5. The fifth mistake is to overestimate the capital remaining after one's death. To meet the death taxes and the general cash obligations of an estate only cash can be used.

6. Don't overlook the loss to your dependents of your experience in making investments. This can easily lead to their making unwise investments and losing capital.

7. Another mistake is to provide too little spendable income for your family. During a man's life every liquid $1,000 can be invested to yield $50 to $60 per year. After his death those thousand-dollar units may well be reduced through death taxes, general cash obligations, and liquidation losses to anywhere from $800 to $600. Then his widow can afford only conservative investments which will yield about $25 per year, and these are further reduced by income taxes.

8. Providing too much taxable income for your family is the eighth mistake. Making arrangements under which the income must go to a certain beneficiary, even in years when the beneficiary has adequate income from other sources, is bad business. In such cases the income left by yourself is put on top of the other income and therefore becomes subject to the higher income tax rates, thus quite unnecessarily reducing the spendable income.

9. The ninth mistake is for a man to overlook the second estate shrinkage at the death of his wife. After his lifetime accumulations have been drastically reduced by death taxes, general estate obligations, and possible liquidation losses, the remaining estate may become subject, at the death of his wife, to the same causes of estate destruction, for the second time, unless he plans ahead for this eventuality.

10. Overlooking the possibility that one may survive his wife is the tenth big mistake. Frequently plans are made which work out perfectly if the wife survives the husband, but which create hardship and unnecessary losses if the husband survives the wife.

11. Another is to overlook the estate shrinkage at the death of children.

12. Another is to overlook the danger of future radical social or economic

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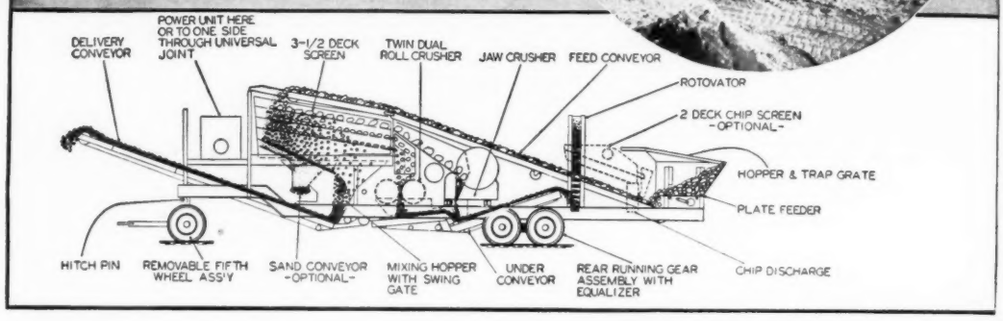

Want top capacity, ready portability, easy set-up, flexible operation? Take a close look at a TwinDual Master and then make your choice. Get the single unit gravel plant that gives you three full stages of reduction with only two crushers. See how the Universal TwinDual Method uses a primary jaw crusher in the first stage, and the TwinDual Roll crusher in the second and third stages.

Compare the Payoff at the discharge conveyor. No two-stage plant of comparable size and weight can equal its performance. You get a more favorable ratio of reduction, less jaw and roll shell wear, less plant maintenance, a better quality uniform gradation finished product at less horse power per ton.

There's a TwinDual Master operating near you. Call in your Universal distributor or write. Ask for Bulletin U516 and 682A.

TWINDUAL MASTER SPECIFICATIONS

Jaw Crusher	1024 RB
Roll Crusher	24" TwinDual
Gyrating Screen	3' x 10' 3½ deck
Chip Screen (optional)	3' x 6' 2 deck
Charging Hopper	2½ yard
Feed Conveyor	30" CF
Under Conveyor	30" CF
Front Delivery Conveyor	30" CF
Sand Delivery Conveyor (optional)	18" CF
Swivel Feed Conveyor (optional)	30" x 32' LF
Rotovator	18" x7'-9" dia.
Tires	8.25 x 20 10 ply (12)
Brakes (optional)	Air-Vacuum-Mechanical
Width	8'—0"
Operating Length	53'—3"
Height set up	12'—6"
Height moving	12'—6"
Weight basic plant	49,600 lbs.*
Power required	115 H.P. Continuous Diesel or equivalent
Rated Capacity tons per hour 1" minus material based upon 25% crushing	125-220

*Less feeder and power.

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changes.

13. The thirteenth and last mistake in this group is to assume that we can avoid trouble by doing things our own way. There is no substitute for planning with the aid of an expert. No contractor would think of having his lawyer estimate that newest potential job, no matter how much he might know about the legal phases of construction contracts.

Estate Conservation

We must constantly bear in mind that the Federal Estate Tax is only one of the reasons why a man's estate may have to pay out cash. Even the smallest estate will be confronted with a 20 per cent shrinkage of cash just to pay such expenses, and this can very well rise to as high as 35 per cent, which it has done in a number of cases.

A financial specialist in the field of estate conservation knows about 200 methods and measures by which estate savings can be effected. Here are just a few examples:

Life Insurance: Check whether policies have any features by which the taxable value might become higher than face value, and if they can be removed. Also, whether or not the policies have any settlement arrangements which are useful in normal times, but which might become financially disastrous in case of serious inflation or in case of war.

Business: Check whether estate savings can be obtained through changing the nature of the business setup. There are a number of instances where such changes have meant a great deal of difference to the estates of business men.

Investments: Check up on which investments could not be sold at any time within a few days. It may be advisable to replace them with more liquid investments or make arrangements for their sale ahead of death.

Your Will: Make certain your will contains maximum income-tax economies at the time of your death and during the years afterward as well. There's a great deal of difference between a will that's just legally valid and a will that is both legally valid and financially practical. Drafting it after your lawyer has consulted with an estate-planning specialist makes the difference. One point he will recommend serves as an example . . . never to mention dollars in your will but always to express yourself in terms of percentages. Dollars are subject to shrinkage and can change a safe future for your wife into an insecure one. Percentages have a much better chance of insuring that she will have the resources that she requires.

Check Your Assets

Just one more point—you are richer than you think!

Check again the assets that will be counted into your estate and how their values will be determined. Not only will you find that estate-wise you are much richer than you think, but that your estate position is not as safe as you had figured it to be. The following checklist will help. It lists some of the assets subject to estate taxes:

1. Cash owned by you outside of the business, accounts in banks, savings banks, etc.
2. Maturity value of life insurance on your life, and death benefits of accident insurance, if any.
3. Bonds and stocks, approximate value (do not deduct loans if any).
4. Interest in close corporation(s), partnership(s), or personally owned business firm(s).
5. Real estate, today's approximate market value (do not deduct mortgages, if any).
6. Property in your home (furniture, rugs, silver, jewelry, antiques, art works, automobiles, etc).
7. Other assets such as mortgages, debts, claims, rights, royalties, patents, etc.
8. Goodwill value of your business.
9. Expected additions to present assets from inheritance, trust funds, and other sources.

The invisible mortage is ever present and must be paid. It can be the forgotten mortgage whose forced payment will reduce an otherwise safe estate to one that will prove to be more of a liability than an asset to your wife and children.

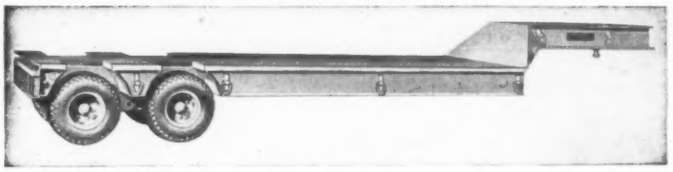
Each of us should plan our reserves in such a way that we can say, "I hope to live for many more years. But, if I should pass on next year, I know I can afford to die!"

Kurt Kauffman-Grinstead of Hot Springs, Arkansas, is an estate-planning expert. He is a member of the National Advisory Board, Investors League, New York City; a director of R. M. Smythe, Inc., New York City; a member of the National Association of Securities Dealers; and a Life Fellow of the Royal Economic Society of England.

Kloeckner Joins Fageol

Robert P. Kloeckner has been appointed Sales Representative for the Fageol Heat Machine Co., Detroit, Mich., manufacturer of space heaters. From headquarters in Chicago, he will handle distribution and sales for the company in Illinois, Wisconsin, and Minnesota.

SOLVE YOUR HAULING PROBLEMS WITH
A "TRANSPORT TRAILER"
Capacities through 75 Ton—Semi and Full Trailers



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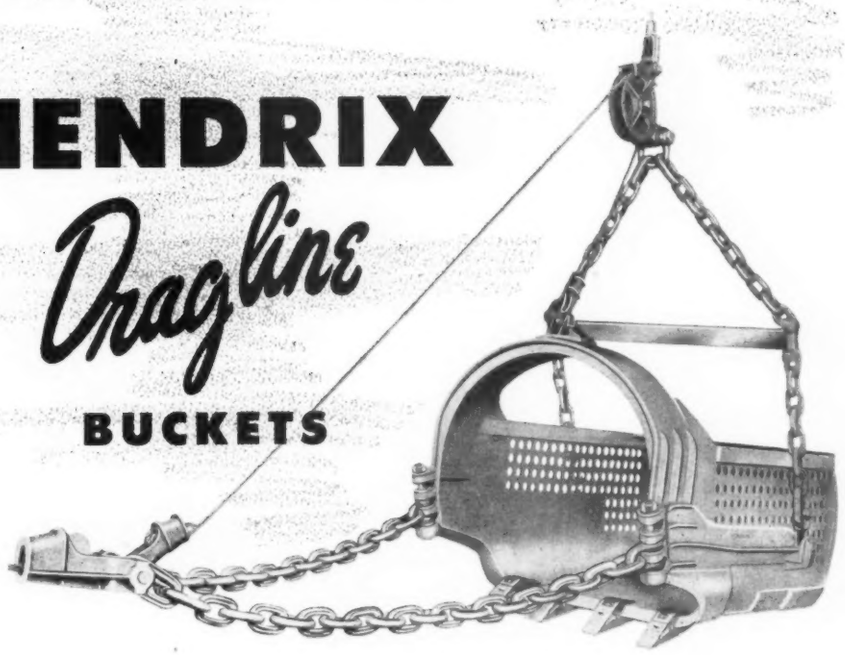

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HENDRIX MANUFACTURING CO., INC.
MANSFIELD – LOUISIANA

Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief extracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Contractors Were Denied Change in a Unit Price

THE PROBLEM: *A government estimate showed that 5,000 cubic yards of concrete were to be poured in a powerhouse substructure. Bidders were warned not to rely on the estimate, which could readily have been found to be excessive by computing the rectangular volume of the structure. Plaintiffs' bid on that item relied on the estimate, but only 2,873 yards were poured. Had that been foreseen the bid would have been higher.*

After the bid was accepted the plaintiffs were apprised that the estimate was probably excessive, but vainly tried to secure a readjustment of the price. They signed the contract, which covered many other items, and performed it. Their claim for extra pay was disallowed by the Government officials. Were plaintiffs entitled to sue for a court decree so modifying the contract as to increase the agreed price, on a theory that they were virtually coerced into signing the contract through prospective forfeiture of their bid bond for 20 per cent of the amount bid?

THE ANSWER: No. (Russ Mitchell, Inc., v. United States, 102 Fed. Supp. 544, decided by the United States Court of Claims.)

The court reasoned: The plaintiffs did not sign the contract under coercion; the contract as a whole was prospectively an exceedingly profitable one, and they had based their bid on high allowance for estimated direct costs and job overhead. (The court said that it would take notice "that the normal profit included in such bids is about 10 per cent, and the normal main office overhead about 6 per cent.") It was unlikely, the court said, that plaintiffs would have reopened the job to rebidding by refusing to contract, because of disappointment in the profit to be derived from this item of work—only one of many other items involved in the contract.

Subcontract Not Assignable

THE PROBLEM: *A subcontract provided that any assignment of it by the subcontractor without the consent of the general contractor should be void. Did that prevent the subcontractor, in view of a statute permitting assignment of claims in general, from assigning moneys due and to become due him, without the general contractor's consent?*

THE ANSWER: Yes. (Allhusen v. Caristo Construction Corp., 103 N. E. 2d 891, decided by the New York Court of Appeals.)

The court said that no good reason appears why an assignee should remain unaffected by a provision in the very contract which gave life to the claim he asserts.

HIGH UP

. . . on the list of "Economy Short-cuts" for the $4 Million Nassau County Sewer Expansion was . . .

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Arthur J. Hendrickson, President.

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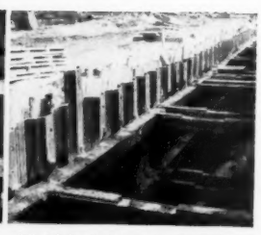
66-inch diameter precast conduit at an average depth of 35 ft.—placed atop a 7-inch concrete slab.



Piling holds back mud for The Sanitary Trunk Sewer conduit which ran 7 miles on Long Island's South Shore.

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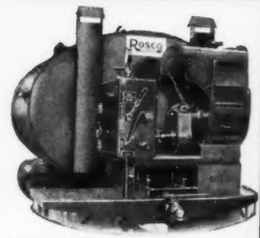

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CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Ave., New York 16, N.Y.

As to the statute, the court said that because it provided that a person may transfer a claim, it does not follow that he may not contract otherwise.

Could Not Increase Wages On Federal Lump-Sum Jobs

THE PROBLEM: *A Federal lump-sum construction contract specified that the price should not be increased because of any increase in wage rates above those scheduled in the contract. The Federal Wage Adjustment Board allowed increases to labor on non-Federal jobs, some of which were being performed by the same contractor. Was the contractor entitled to pay labor at the increased rate on his Federal job? Could he claim an increase in contract price on a theory that he had to pay the wage rates prevailing on non-Federal jobs to keep labor from leaving the Federal job?*

THE ANSWER: No. (Kirchof v. United States, 102 Fed. Supp. 770, decided by United States Court of Claims.)

The court said the contractor was allowed an increase in price to cover increased wage costs on work done under change orders; this did not show right to an increased allowance on the unchanged work covered by the original contract. The change orders were in effect new contracts.

Recognizing that Uncle Sam's left hand need not know what his right hand is doing, the Court of Claims observed that the contractor might have been virtually compelled by the Wage Adjustment Board to pay the increased wage rates, but he was not so compelled by the Government in its capacity as a party to the contract.

The court reconciled its decisions in two previous cases where increases in price were allowed because contractors were compelled by the Government to raise wages. (Sunswick Corp. v. United States, 109 Ct. Cl. 772, 75 Fed. Supp. 221, and Paretta Contracting Co., 109 Ct. Cl. 324.) In this case the contracting agency did not order payment of the higher wage rates.

Compensation Insurance Covered Extra Employee

THE PROBLEM: *The driver of a tractor on a clearing job was killed when the tractor overturned. He and the tractor had been brought upon the job by the owner's engineer to speed up performance, but the driver was placed upon the contractor's payroll under agreement that he should be regarded as the latter's employee. The contractor's insurer against workmen's compensation audited the contractor's payrolls, computing insurance premiums it accepted. The contractor also paid social-security tax on the employee. Did the contractor's insurance cover the accident?*

THE ANSWER: Yes. (Peek v. Adams, 243 S. W. 2d 562, decided by the Arkansas Supreme Court.)

Unjustified Strike Banned

THE PROBLEM: *Unions struck against a municipal construction project on which civil-service labor and independent contractors were engaged. No dispute between the contractors and their employees was shown to exist. Was the city entitled to enjoin the strike and picketing?*

THE ANSWER: Yes. (City of Los Angeles v. Los Angeles Building & Con-

(Concluded on next page)

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Further information or descriptive literature can be secured from any advertisers in this issue of CONTRACTORS AND ENGINEERS MONTHLY. Just write name of manufacturer and product of interest to you on the extra line provided on the post card facing page 16, fill in your own name and industry connection, mail to us and we'll do the rest.

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Avoid Legal Pitfalls

(Continued from preceding page)

struction Trades Council, 240 Pac. 2d 16, decided by the California District Court of Appeal, Second District.)

The court said that facts presented did not warrant an assumption that the injunction was intended to or would be construed as prohibiting strikes or peaceful picketing by private employees to enforce legitimate demands against private employers.

Operator Was Lessee's Employee, Not Owner's

THE PROBLEM: *A contractor leased a crane and its operator. The operator, who was under sole control of the contractor for the time being, allegedly operated the crane so carelessly on a highway as to cause it to come in contact with overhead high-tension wires, thereby injuring one of the contractor's employees. Was the owner of the crane liable?*

THE ANSWER: No. (Knutson v. Lambert, 51 N. W. 2d 580, decided by the Minnesota Supreme Court.)

The court said: The crane operator, although in the general employment of the owner, was for the time being the contractor's employee. The owner could not be held liable on a theory that the accident resulted from his failure to furnish electric grounding equipment with the crane, in violation of a statute of Wisconsin, where the accident occurred. And failure of the power-line company to post danger signs required by statute did not make that company liable, because the injured man and the operator of the crane knew of the overhead power line and the danger it presented.

The decision is in line with that reached by the Minnesota court in an earlier case, where an electric company was exonerated from liability for injury to an employee. This man climbed the boom of a concrete mixer, which was loaded on a flatcar, and received a shock from current carried by a nearby power line. (Bunten v. Eastern Minnesota Power Co., 228 N. W. 332.)

Abutters Could Challenge Assessment for Paving Work

THE PROBLEM: *A city engineer certified that a paving contract had been performed and the city accepted the work. Could an abutter challenge the validity of an assessment against his property on the ground that the contract had not been substantially performed?*

THE ANSWER: Yes. (Govier v. Gunnels, 246 S. W. 2d 339, decided by the Texas Court of Civil Appeals, Galveston.)

The court said that the only ground for levying such assessments is the enhancement of the value of a piece of property by an improvement; therefore substantial performance of the construction contract is essential to a valid assessment. The courts will not disturb municipal authorities' decisions so long as they act within the discretion allowed them by law. But the power of such authorities to accept a contractor's work is limited to instances in which there has been substantial performance of the contract.

Watchman Could Not Claim Overtime Pay

THE PROBLEM: *A contractor's night watchman was hired at a $50 weekly salary and was required to be on duty twelve hours a day, seven days a week. For more than ten months he accepted the agreed salary, without claiming that he was entitled to overtime. Could he later, on quitting, collect overtime covering the period of his employment?*

THE ANSWER: No. (Kitchens v. Lee, 69 S. E. 2d 67, decided by the South Carolina Supreme Court.)

The court said that the long-continued weekly payments, unqualifiedly accepted by the employee, evidenced a mutual interpretation of the contract by the parties as excluding right to overtime pay.

Priority of Creditor Rights

THE PROBLEM: *A public contractor assigned to his surety sums which would become payable under a construction contract, in order to indemnify the surety for payments it would have to make on the contractor's behalf. Afterwards the contractor assigned to a bank funds about to fall due under the contract. The surety had to pay claims against the contractor on account of labor and materials furnished on the job. Did the surety's right to be paid out of the contract proceeds come ahead of the bank's claim against those proceeds?*

THE ANSWER: Yes. (Commercial Bank v. Board of Public Instruction, 55 So. 2d 552.)

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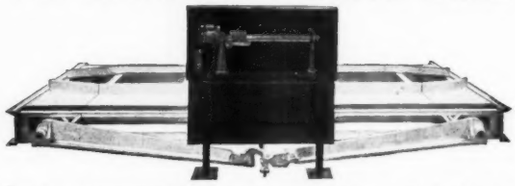

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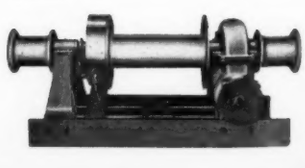

Contractor Widens Narrow Old Highway

Rehabilitation Job Widens Riverdale Road in Ogden; Will Now Carry Four Lanes for Many Useful Years

• THE highway south of Ogden, Utah's city limits, which people thought was worn out in 1931, is now an extremely usable 4-lane divided expressway,

Many more years of life have been built into the old highway by Parson & Fife, contractor of Brigham, Utah, under a $300,000 Federal-Aid contract with the Utah Department of Engineering, which builds Utah's highways. What had been a worn-out traffic bottleneck is a wide, fast thoroughfare, with head-on accidents eliminated by a dividing median.

New construction through the 1.091-mile stretch would have used an enormous amount of available highway funds. The design illustrates what can be done at reasonable cost to add many useful years to such worn-out roads.

The old road was first built to all-weather standards back in the early 1920's. It consisted of 18 feet of 7-inch portland-cement concrete. At that time it was the pride of Ogden and the envy of everybody else in Utah. By 1931, ever-increasing traffic had made it dangerous, too narrow, and obsolete. Six-foot widening strips of portland-cement concrete were then added on each side of the original pavement. The road served to carry city and U. S. 91 traffic for many years, but by 1940 maintenance costs were rising rapidly. They almost ran away with the highway budget before the road could be called up for contract.

Two-Side Widening

Parson & Fife's job called for work on both sides of the old pavement. In fact, the center pavement, which was pretty well beaten to pieces, is the location of the dividing median, although it does not cover all the old slab. The contract called for excavation on both sides to make room for a 7-inch portland-cement widening strip from 9 to 11½ feet wide, and an 8-inch portland-cement gutter section 10 feet wide, all on the east side. Plans for the west side called for a 7-inch widening strip varying from 9 to 15½ feet wide, and an 8-inch gutter section 10 feet wide, also of portland-cement concrete.

Underneath the portland-cement widening sections and gutters a blanket of granular subbase material was placed. It is 5 inches thick under the widening strips and 8 inches thick under the gutter sections. The gutters are shaped with a 4-inch rounded channel section to carry surface water away to inlet gratings, which drain through cross pipes to local irrigation ditches.

With the exception of the concrete gutters, the entire roadway is topped with a 3-inch pavement of asphaltic concrete, made with 85-to-100-penetration asphaltic cement, and laid in two 1½-inch courses. The concrete-gutter level was set several inches higher than the widening strip so the gutter top would be flush with the asphaltic-concrete pavement.

There was no way to detour traffic around the project, so the schedule was organized to carry traffic through construction with as little delay as possible. The work was carried on by first widening the east portion and completing it, even to asphaltic concrete. Traffic could then be routed over the completed work while the west half was constructed.

(*Continued on next page*)

Ray Day Photo

From the finishing end of the Ogden widening operation—the Jaeger-Lakewood spreader and MultiFoote paver.

B.F.Goodrich

Tires in use twelve months —and never off the wheel!

● B. G. Young & Sons of Johnson City, Tenn., do general road contracting throughout Tennessee, North Carolina and Virginia. The company's 20 trucks, 6 tractors and 11 other off-the-road units roll daily over roads covered with sharp, blasted rock and gravel.

Take the unit pictured above, for example. Its tires have continuously carried 16 tons of equipment plus a payload of 20 tons of rock and dirt on just such roads for over a year. Yet not one of these B. F. Goodrich Universal tires has ever been removed from its wheel!

No wonder Mr. B. G. Young, partner of this company, says, "The service we obtain from B. F. Goodrich tires with the nylon shock shield is far and beyond anything we have experienced before."

Universal tires give such superior service even under the toughest operating conditions because the tread is made of specially-compounded, cut-resistant rubber. The tread wedges give positive 2-way traction. And Universal tires—like all tires of 8 or more plies in the complete B. F. Goodrich line—are built with the nylon shock shield, exclusive BFG development.

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There's a B. F. Goodrich tire to meet your off-the-road requirements. Most of these off-the-road tires are also available in all-nylon construction. See your BFG dealer—he's listed under Tires in the Yellow Pages of your telephone book—or write: *The B. F. Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Contractor Widens Narrow Old Highway

(Continued from preceding page)

DW-20 Moves Excavation

By good planning and a happy coincidence, the earthwork was balanced within the job. Parson & Fife had several Caterpillar DW20's in the Brigham yard at the time work began April 7, so one of these machines was sent down to Ogden to rough in the grade. Material was easy to dig, and the DW20 had no trouble digging the widening and gutter sections with very little delay. A flagman was used at crossover points as a safety measure, but the grading was easy and uneventful. A sheepsfoot roller compacted portions used as fill.

In addition, some granular gravel in the roadway was saved for use under the new concrete sections. It was put in place and compacted mostly by the passage of the DW20. Later on, a heavy steel roller was used when this material was finally shaped.

Ray Day Photo

Parson & Fife recently purchased this Heltzel batch plant, which was used on the Ogden job to batch the concrete. Enough permanent business has appeared that the plant may stay in Ogden.

Fine-Grade and Forms

Approximately 5,000 feet of Blaw-Knox steel forms were brought in to form the right side of the paving strip. These were set by a 6-man labor crew working to a string line and surveyor's bluetop grade stakes. The forms were set in a trench excavated largely by hand, with a little help from a Caterpillar No. 12 motor grader on the job. Tamping was also a hand operation. Widths up to 12 feet were set.

Shaping and compacting the granular base under the widening section was much easier than it was under the gutter section, where a 4-inch parabolic curve had to be formed. The grade was shaped roughly by the No. 12 motor grader. When grade was established to within an inch or two, the motor grader hooked on to a small shop-built fine-grade planer, and dragged it along. A 3-man labor crew worked with the machine to help dispose of material. Usually the material

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Photographs may not lie; but, here's one that falls far short of telling the whole truth about the remarkable performance records chalked up by this Republic Rubber's Coal Handling Conveyor Belt.

But, then it's quite a story! You can see for yourself there's lots of sky overhead and that means sun . . . constant, unrelenting sun beating down on the conveyor belt surfaces, until seasonal changes bring about onslaughts of rain, snow and sleet.

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With these facts in mind and knowing that when the ship moves out, there's nothing to protect the belt against spraying lake water, consider this:

The belt is now fourteen years old and still going strong!!!

Purposefully, we've left the photo unretouched to show you just what a 14-year old Republic Rubber Conveyor Belt really looks like . . . to show you just how well a Republic Conveyor Belt stands against the ravages of time, hard labor and all the elements can throw at it. Incidentally, the dark spots you see on the belt's surface aren't worn places at all. That's water . . . water that makes ordinary conveyor belts mildew and prematurely fail, but holds few terrors for Republic Conveyor Belting because they're "mildew-proofed"!

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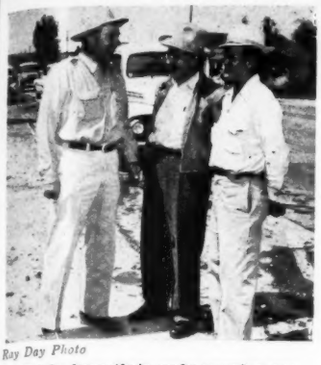

Ray Day Photo

All jobs have their early-morning pre-coffee "conferences". Left to right in this one are Contractor Douglas Fife, Resident Engineer Dean Toone, and General Superintendent L. H. Fairless.

could be dragged on ahead without secondary loading and hauling.

A Buffalo-Springfield 3-axle tandem steel roller then moved in for the final compaction, making several passes to develop about 95 per cent density in the granular material.

The 3-inch exposed side of the gutter section, elevated above the widening strip, was formed with special sections of 3 x 4-inch angle iron, each section having three welded-steel pegs to hold it solid in the subbase. The angles were set on 2 x 4's, with wooden wedges underneath to make them snug. Steel forms were oiled with diesel fuel before the concrete was placed.

Paving

The portland-cement concrete was dry-batched at the north side of Ogden and hauled by a fleet of Ford F-6's to the job, where a paver took over the mixing job. A 34-E dual-drum Multi-Foote paver was used. It was spotted on the old slab to place the widening strip, and on the widening strip to place the gutter section. Each strip was placed full length through the job, without jumping around.

Mixing water was readily available. It came from an Ogden hydrant near the north end of the project, and was hauled to the paver by a 3,000-gallon International-mounted trailer unit. For long periods of time the trailer moved along with the paver, feeding it direct. An average day's run used up nearly 10,000 gallons of water.

The fresh concrete was placed by the paver buckets on the subbase, directly in front of a Jaeger-Lakewood spreader, which distributed the material evenly between the forms. On the gutter section, the transverse screed bars of the machine were formed with wood timbers to simulate the convex drain gutter. After it finished its work, the gutter section was fairly well outlined.

Either on gutter or widening strips, however, a finishing crew was assigned immediately behind the paver and spreader. The gutter sections were hand-screeded with special strikeoff templates which helped to give the watercourse its final shape. Finishers with long-handled wood floats then put on the final surface. In addition, the gutter section received a final wire-broom finish. The concrete was cured by Hunt Process membrane solution.

Batching and Hauling

Parson & Fife had an excellent setup for batching and hauling the concrete. A new Heltzel manual batch plant was set up in north Ogden, on Wall Street, and the necessary sand and two sizes of aggregates were trucked down about 30 miles from the company's commercial sand and gravel plant near Brigham. Bulk cement was supplied by Ideal Cement Co. from the plant at Devil's Slide, Utah.

A great deal of local support for permanent work for the plant has already appeared, and it may be that the demand for dry-batched concrete will justify leaving the setup at Ogden. It is as modern as tomorrow, and ideally located for serving the immediate area around Ogden.

Ford F-6 batch trucks were used, and four 1½-yard batches were hauled per trip. Parson & Fife has recently purchased a new fleet of 10 Ford F-6's, which are being used for gravel and batch hauling. Last year Utah began a rigid enforcement program, and axle loads in excess of 18,000 pounds were cause for arrest. Parson & Fife, like many another contractor, was caught with heavier trucks—some Fords, some Internationals.

The net weight of these heavy-duty hauling units, built for big payloads, was so great that the legal payload possible was cut down to about 5 tons. The company made quite a serious study and found that F-6's would carry an 8½-ton payload. Since they operated at less cost than the bigger trucks, with less maintenance cost, the selection was made. Both J. B. Parson and Douglas Fife, his partner, have been pleased about it ever since.

While record paving yardage was not made, nor spectacular outputs sent to the job, progress was good. From start to finish the work was completed in about 100 calendar days.

Equipment Upkeep

The company has an excellent equipment-upkeep program. Much of its equipment is new, and the owners expect to keep it in good condition for its useful life.

The service and repair program is aimed at following through on manufacturers' recommendations for every piece of equipment. To start with, every piece of equipment the company owns was selected right; in other words, it was picked to do some specific job the

(Concluded on next page)

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Contractor Widens Narrow Old Highway

(Continued from preceding page)

company has. DW20's, for example, were picked to haul large yardage over long hauls at low cost. The selection of equipment is actually a part of the service program.

Brigham has the company headquarters shop, where major repairs and overhaul jobs are performed during December, January, and February by key men retained through the winter. Summer mechanical work consists mainly of service, lubrication, and oil changes in accordance with manufacturers' recommendations, and the replacement of small parts as they wear out. By giving the machines the service they need in summer, winter repair is materially reduced in scope and cost. Both Parsons and Fife are firmly convinced that good maintenance pays dividends.

When CONTRACTORS AND ENGINEERS MONTHLY visited this fast-moving job, the first asphaltic concrete was only a few days off, even though it was in May. A subcontract had been arranged with Gibbons & Reed of Salt Lake City to mix and lay the material, since Parson & Fife's Standard plant is well tied up for the working season of 1952 with as much construction as it can handle. Gibbons & Reed used a Madsen asphalt batch plant, and a Barber-Greene finisher to spread the material.

The completed job closes the bottleneck between the south edge of Ogden and the new Ogden Overpass, completed three years ago. Traffic is able to get out of the city at high speed. It is expected that the current improvement will require little maintenance for at least several years.

Personnel

The Ogden job was supervised under general direction of Chairman D. H. Whittenburg of the Utah Department of Engineering, with E. G. Johnson as Chief Engineer and J. Q. Langford as Construction Engineer. Jack H. Craven at Ogden is District Engineer, and Dean W. Toone is Resident Engineer.

Douglas Fife assumed personal command for the contractor, assisted by General Superintendent L. H. Fairless.

New Marine Fender Cradles Superliner

For the nation's newest merchant vessel, the superliner United States, to settle down to rest after a high-speed run across the Atlantic is no easy matter. Without special facilities, the impact of 53,300 tons berthing at Pier 86 in the North River, New York City, could be destructive to both hull and pier.

For this reason a new type of marine fender has been designed and constructed by George W. Rogers Construction Co., New York City, working with Goodyear Tire & Rubber Co. of Akron, Ohio. This new shock absorber is expected not only to do away with the possibility of damage, but also to permit docking even when the strong ebb tide of the North River is unfavorable.

The impact of the 53,300-ton superliner, United States, when she berths at Pier 86 in the North River, New York City, is absorbed by this new marine fender. It is composed of two concentric arcs of pilings, cushioned by cylindrical rubber dock fenders.

The fender consists of two concentric arcs of piles, sunk deep in the river bottom, with the space between taken up with special rubber cylindrical dock fenders. There are 22 piles in the outer ring and 21 in the inner ring attached to the pier. Ten vertical rubber tubes, made of a high-tensile compound, and each 12 inches in outer diameter, hang along the inner arc of piles. Outside of these are superimposed four 26-foot-long rubber cylinders, each 15 inches in diameter. Four horizontal wooden wales are fastened to the inside of the outer piling arc and are covered with vertical oak sheeting. It is this sheeting that makes contact with the horizontal rubber cylinders when pressure is exerted on the outer piles. The piling arcs, together with these huge rubber tubes, make up the entire fender, which provides a high degree of resiliency and 27 inches of compression space to absorb the shock.

Vladimir Nichols, Vice President and General Manager of the Rogers Company, was in charge of the construction project. E. G. Carey was Chief Engineer.

With proper use, the fender is expected to cushion the "first lady of the seas" for the next 20 years.

Folder on Insulation

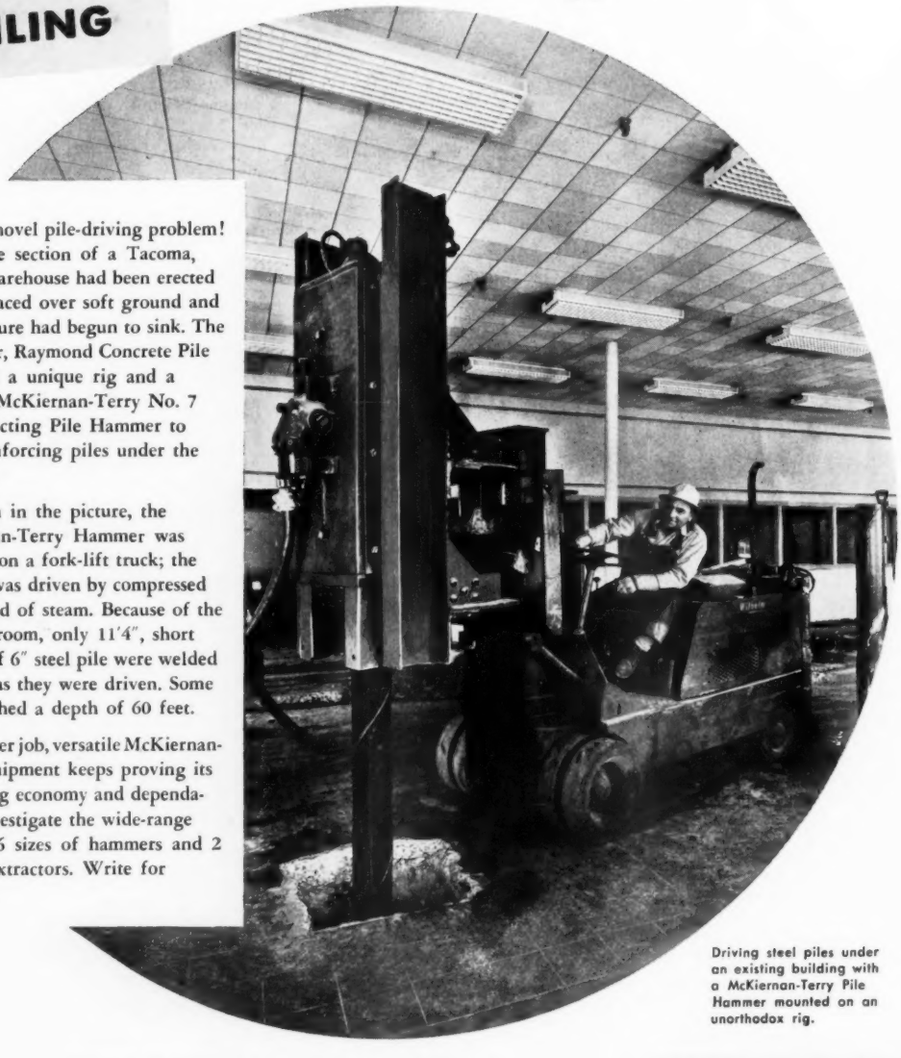
A 4-page folder on the use of Foamglas cellular glass insulation in sandwich-panel construction has been prepared by Pittsburgh Corning Corp., 307 Fourth Ave., Pittsburgh 22, Pa. It describes Foamglas as a lightweight, incombustible, vermin-proof material composed of still air sealed in minute glass cells. Resistance to moisture and chemicals are other features.

On-the-job photos show Foamglas being used for the thermal insulating core of the sandwich panel. Information on the panel design accompanies each photo.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 591.

HOW TO DRIVE PILING

Inside an Office!



Here's a novel pile-driving problem! The office section of a Tacoma, Wash., warehouse had been erected on fill placed over soft ground and the structure had begun to sink. The contractor, Raymond Concrete Pile Co., used a unique rig and a versatile McKiernan-Terry No. 7 Double-Acting Pile Hammer to drive reinforcing piles under the building.

As shown in the picture, the McKiernan-Terry Hammer was mounted on a fork-lift truck; the hammer was driven by compressed air, instead of steam. Because of the low headroom, only 11'4", short sections of 6" steel pile were welded together as they were driven. Some piles reached a depth of 60 feet.

On job after job, versatile McKiernan-Terry equipment keeps proving its piledriving economy and dependability. Investigate the wide-range line of 16 sizes of hammers and 2 sizes of extractors. Write for bulletin.

Driving steel piles under an existing building with a McKiernan-Terry Pile Hammer mounted on an unorthodox rig.

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Convention Calendar

September 14-18—Wire Reinforcement Meeting
Fall Meeting, Wire Reinforcement Institute, Broadmoor Hotel, Colorado Springs, Colo. Frank B. Brown, Managing Director, 1049 National Press Bldg., Washington 4, D. C.

September 15-20—Reinforcing Steel Institute
Annual Convention, Concrete Reinforcing Steel Institute, Broadmoor Hotel, Colorado Springs, Colo. H. C. Delzell, Managing Director, 38 S. Dearborn St., Chicago 3, Ill.

September 29-October 2—Steel Meeting
Annual Convention, American Institute of Steel Construction, Empress Hotel, Victoria, British Columbia. L. A. Post, Executive Vice President, 101 Park Ave., New York 17, N. Y.

October 1-3—NACE Regional Meeting
South Central Region Meeting, National Association of Corrosion Engineers, Jung Hotel, New Orleans, La. A. B. Campbell, Executive Secretary, 1061 M&M Bldg., Houston 2, Texas.

October 15-17—Southeastern Highway Meeting
Annual Meeting, Southeastern Association of State Highway Officials, Hotel Roosevelt, New Orleans, La. J. A. Kinkead, Registration Chairman, P. O. Box 4245, Baton Rouge 4, La.

October 20-24—National Safety Meeting
Fortieth National Safety Congress and Exposition, Conrad Hilton Hotel, Chicago, Ill. R. L. Forney, General Secretary, 425 N. Michigan Ave., Chicago 11, Ill.

October 26-November 1—Panamerican Congress of Road Builders
Extraordinary Panamerican Congress of Road Builders, Mexico City, Mexico. Ing. Armando Salinas, Executive President, Organizing Commission, Marconi 2, Desp. 36, Edificio Garantias, Mexico, D. F.

October 27-29—Lubricating Grease Institute
Annual Meeting, National Lubricating Grease Institute, Edgewater Beach Hotel, Chicago, Ill. Harry F. Bennetts, Executive Secretary, 4638 J. C. Nichols Parkway, Kansas City 2, Mo.

November 5-7—Virginia Highway Meeting
Sixth Annual Virginia Highway Conference, Virginia Military Institute, Lexington, Va. R. P. Ellison, Executive Assistant, Virginia Department of Highways, 1221 E. Broad St., Richmond 19, Va.

November 7-8—Professional Engineers' Meeting
Fall Meeting, National Society of Professional Engineers, Jefferson Hotel, Richmond, Va. Paul H. Robbins, Executive Director, 1121 Fifteenth St., N. W., Washington, D. C.

November 13-15—ASCE International Meeting
International Convention, American Society of Civil Engineers, Condado Beach Hotel, Puerto Rico. Don P. Reynolds, Assistant to the Secretary, 33 W. 39th St., New York 18, N. Y.

December 9—Concrete-Producers' Meeting
Eighth Annual Convention, New York State Bituminous Concrete Producers Association, Hotel Statler, Buffalo, N. Y. Gus Rayner, Executive Secretary, Box 667, Albany N. Y.

December 10-12—AASHO Meeting
Annual Convention, American Association of State Highway Officials, Municipal Auditorium, Kansas City, Mo. Rex M. Whitton, Missouri State Highway Commission, Jefferson City, Mo.

January 13-15, 1953—National Constructors
Annual Meeting, National Constructors Association, Hotel Commodore, New York, N. Y. J. O'Donnell, President, 50 E. 41st St., New York, N. Y.

February 9-11—ARBA Meeting
Annual Convention, American Road Builders' Association, Statler Hotel, Boston, Mass. Lt. Gen. Eugene Reybold, Executive Vice President, International Bldg., Washington 4, D. C.

March 2-6—ASTM Meeting
Spring Meeting and Committee Week, American Society for Testing Materials, Hotel Statler, Detroit, Mich. Executive Secretary, 1916 Race St., Philadelphia 3, Pa.

Griffin Wellpoint Doings

A complete warehouse and sales office is being opened by Griffin Wellpoint Corp., New York, N. Y., in Houston, Texas. This associate company, Griffin Wellpoint, Inc., will service the organization's southwestern area. The building is located at 6100 Harvey Drive.

Robert H. Hockberger has been appointed Manager of Griffin Equipment Co., Inc., Hammond, Indiana.

New 4-Wheel Drive

A new 4-wheel-drive package for Chevrolet and GMC trucks is now offerred by The Northwestern Auto Parts Co., 834 N. 7th St., Minneapolis 11, Minn. The Powr-Pak consists of a banjo-type front driving axle and transfer case with all brackets and modification parts required for mounting. The transfer case provides 8 forward and 2 reverse speed ratios.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 565.

Bulletin on New Compressor

A new bulletin on the Model 105 compressor has been released by Davey Compressor Co., N. Water St., Kent, Ohio. It illustrates the 4-wheel, 2-wheel, and skid units on several types of construction jobs.

The compressor assembly is the 2-stage 2-cylinder reciprocating V-type. It is powered by either a Hercules gasoline or an International diesel engine. The unit is protected from the weather by a steel housing fitted with hinged doors. Double toolboxes are standard equipment.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 638.

The automatic exhaust pipe cover. Sizes available to fit from 1" to 6-3/16" exhausts, O. D.

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WEATHERCAP provides positive year 'round protection for all engines with vertical exhaust pipes: compressors, road pavers, mixers, crushers, generators, etc. Fully automatic—opens and closes instantly by means of engine exhaust. Seals out rain, snow, dirt, insects . . . prevents flooded pistons, cracked cylinder heads, rusted or warped valves. Quality-built of heavy gauge steel with balanced fins made to uniform specifications conforming to engine exhaust pressures. Low in cost — years of service. Immediate delivery. Write today for full particulars and prices.

A PROFITABLE TOOL WITH MANY USES!

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PAVEMENT BREAKING—Used by municipalities and utilities to make street openings, break curbs, and cut trenches.

ASPHALT CUTTING—An easy, fast job with a Barco Hammer.

EMERGENCY WORK—Day or night, one man can take tool to any location.

HERE'S why owners of the *improved* Barco Gasoline Hammer are enthusiastically acclaiming it as *"A Profitable Tool With Many Uses!"*

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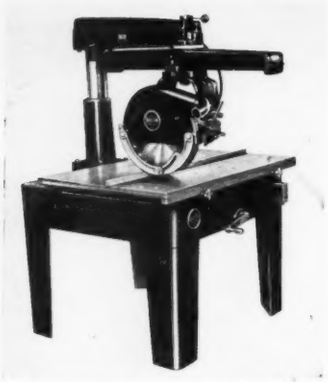

The Delta radial saw has front controls, an aluminum safety guard, and front guide-fence controls. The 16-inch blade cuts to a depth of 5⅛ inches.

Radial Saw Features Cutting Flexibility

A 16-inch radial saw that can swing, spin, and tilt is offered by Delta Power Tool Division of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa. The motor and arm-track make a full 360-degree rotation at a fixed point above the worktable, providing full capacity for right or left-hand angle cuts. Locking at each 90-degree point, the motor and yoke rotate a full 360 degrees under the arm-track. Bevel stops are provided at 0, 30, 45, 60, and 90-degree positions when tilting within the yoke.

Other features of the saw include front controls, an aluminum safety guard, and front guide-fence controls. Electric motors in 3, 5, and 7½-hp ratings are available. The maximum depth of cut with the 16-inch blade is 5⅛ inches.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 571.

Roller Coats Fence

A long-nap lamb's-wool roller for coating wire fences is announced by Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill. The roller is dipped into the container and pulled up on a flat board surface to remove running surplus material. It is then applied to the area to be coated. Even the barbed wire on top of the fence can be roll-painted, although the pipe framework and supporting arms holding the barbed wire are best done by brushing after the fence has been roll-coated.

The company claims that 99 per cent of the material is used on the fence rather than on the workman and on the ground. Also, at least 70 per cent of the other side of the fence is coated at the same time, due to the rolling action. There is no splashing, dripping, or spray, the company says, and the job is done in about half the time needed for ordinary brush or spray methods.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 620.

A new wrinkle in fence painting—a lamb's-wool roller. It does 70 per cent of the other side of the fence at the same time.

Methods of Measuring

A 63-page booklet entitled "Precision —A Measure of Progress" traces the development of measuring devices from the time of Noah to today. In easy-to-follow style, it leads the reader, with illustrations, from the elbow-to-middle-finger-length cubit, through barleycorns, micrometers, and interferometry, down to present-day spectroscopy. It gives a glossary of weights and measures, and a metric conversion table.

This literature is available in limited quantity to teachers, libraries, and other educational institutions by writing to Educational Relations Activity, General Motors Corp., Detroit 2, Mich., or by using the Request Card at page 16. Circle No. 650.

A new rear-engine drive is available on truck mixers made by the T. L. Smith Co., Milwaukee 10, Wis. Circle No. 700 (card at page 16) for further information.

Advance-Design

CHEVROLET TRUCKS

These PLAIN HARD FACTS are important to economy-minded truck buyers

first in demand in value in sales

CHEVROLET

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CHEVROLETS LIST FOR LESS

First cost—*the list price*—is less for a Chevrolet than for any comparable truck capable of handling the same payload. Chevrolet's position as the world's largest manufacturer of trucks makes possible production savings that are passed on to you.

Fact No. 2

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Proved Chevrolet truck features save money over thousands of miles. Time-tested Valve-in-Head engines, rugged hypoid rear axles, extra-sturdy channel-type frames, Flexi-Mounted cabs, Ball-Gear steering, Synchro-Mesh transmissions, all contribute to low operating costs with high dependability.

Fact No. 3

EACH TRUCK TAILORED TO ITS JOB

Every Chevrolet truck is *factory-matched* to the job it's going to do. Tires, axles, frame, springs, engine, transmission, and brakes are right for the operating conditions and load. Whatever your job is, there's a Chevrolet truck to fit it.

Fact No. 4

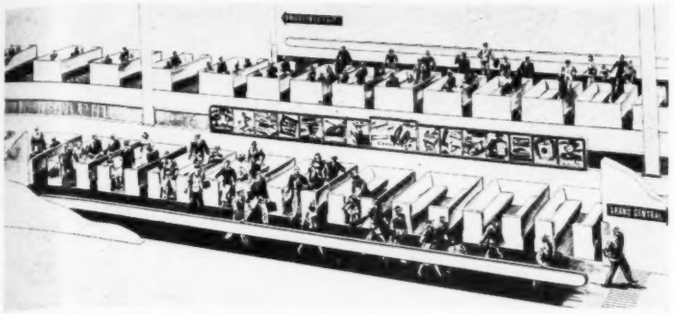
WORTH MORE AT TRADE-IN TIME

Chevrolet trucks traditionally bring more at resale than other makes costing about the same when new. Chevrolet trucks keep their value longer and give you real, substantial savings right up to the day you sell them. See your Chevrolet dealer soon.

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

TWO GREAT VALVE-IN-HEAD ENGINES—Loadmaster or the Thriftmaster—to give you greater power per gallon, lower cost per load • POWER-JET CARBURETOR—for smooth, quick acceleration response • DIAPHRAGM SPRING CLUTCH—for easy-action engagement • SYNCHRO-MESH TRANSMISSION—for fast, smooth shifting • HYPOID REAR AXLE—for dependability and long life • TORQUE-ACTION BRAKES—on light-duty models • PROVED DEPENDABLE DOUBLE-ARTICULATED BRAKES—on medium-duty models • TWIN-ACTION REAR BRAKES—on heavy-duty models • DUAL-SHOE PARKING BRAKE—for greater holding ability on heavy-duty models • CAB SEAT—with double-deck springs for complete riding comfort • VENTI-PANES—for improved cab ventilation • WIDE-BASE WHEELS—for increased tire mileage • BALL-TYPE STEERING—for easier handling • UNIT-DESIGNED BODIES—for greater load protection • ADVANCE-DESIGN STYLING—for increased comfort and modern appearance.

CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN



An artist's conception of the loading and unloading platform for a Grand Central-Times Square subway conveyor belt. New York is considering the idea. Goodyear is experimenting with a passenger conveyor belt.

This Conveyor Belt Carries Passengers

Anyone who has pursued the "next shuttle leaving" from platform to platform at Times Square or Grand Central subway stations in New York City, will be interested in a moving sidewalk designed by the Belting Department of Goodyear Tire & Rubber Co., Akron, Ohio. For over a year hundreds of human guinea pigs have taken part in more than 1,000 tests on the "escalator that doesn't go upstairs", and it has emerged triumphant. Built by Goodyear and Stephens-Adamson Mfg. Co. in order to record scientific data for final engineering plans on the high-speed conveyor-belt subway system proposed for New York City, the 68-foot Goodyear experimental passenger conveyor belt is now being studied by the city's Board of Transportation as a replacement idea for the Grand Central-Times Square shuttle. Colonel S. H. Bingham, head of the Board, is responsible for the original suggestion to use such a system.

The shuttle-replacement plan calls for the use of moving 6-foot-wide platforms for loading and unloading, far enough apart to direct traffic flow into one-way streams; and closely spaced passenger cars on an endless track of rubber conveyor belts and rubber-tired banks of accelerator wheels. At either end of the shuttle passengers would walk directly aboard the loading platform, alongside which—moving at the same speed (1½ mph)—would come a continuous stream of small passenger cars with seats. Twenty-five cars, each seating 10 people, would pass the loading platform every minute. After leaving the loading platform, the cars would be speeded up to 15 miles an hour over banks of accelerating wheels and on the main conveyor belts; and at the other end they would be slowed down by similar banks of wheels and would pass onto a belt moving at unloading-platform speed. Passengers would step out onto the unloading platform and walk off at the far end; and the empty cars would be turned around by means of a large wheel and would then move alongside a loading platform for passengers going in the opposite direction. The over-all length of the experimental conveyor belt, including entrance and exit ways, is 85 feet. The belt itself is 24 inches wide and is driven by a 3-hp electric motor.

Is all this safe? It certainly is. Women with all kinds of shoes, men laden with packages, children walking by themselves or carried by adults, have all helped to prove it. Most interesting test was a machine placed on the moving belt to measure the severity of vibration that would be felt by a human being. This machine, says the manufacturer with more zest than gallantry, even recorded the vibration shock that would be experienced by a heavy woman in spike heels, the most critical vibration test of all.

Data on Pipeline Trencher

A 4-page bulletin on the pipeline Trenchliner for mile-a-day cross-country trench production is issued by the Parsons Co., Box 431, Newton, Iowa. The wheel-type Model 215 has a range of 30 digging speeds, from 6.2 inches to 18½ feet per minute, and cuts 13 to 31 inches wide, down to 6 feet deep.

The Model 215 Trenchliner is equipped with standard tractor crawlers and self-cleaning lug-type shoes. Treads are 18 inches wide and have replaceable links and pins and sealed bearing-mounted crawler rollers. The machine exerts a low ground-bearing pressure of 6 psi.

A series of on-the-job photographs show other Model 215 features including friction clutch control of the digging wheel; self-sharpening Tap-In digging teeth; and a shiftable and reversible spoil conveyor for discharging material on either side of the machine. All main gears are enclosed and running in oil to assure dependable performance. Shaft openings are dirt-sealed and a choice of two standard-make 55-hp diesel engines is available.

This literature may be obtained from the company, or by using the Request Card that is bound in at page 16. Circle No. 562.

"BERG" Concrete Surfacer

R2-AS Model

A light-weight, portable, electric motor-driven Concrete Surfacer consisting of the Model R2 Right Angle Head and Model AS Motor Unit.

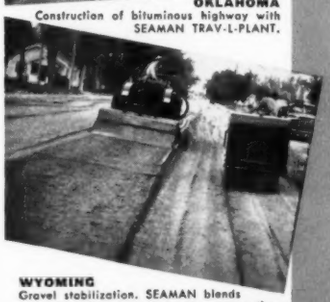
Ideal for surfacing concrete buildings, bridges, dams, walls and many other applications.

Quickly converted into the Model V2-AS Concrete Vibrator for Internal vibration by substituting the Model V2 Vibrator Unit for the above Head.

The Concrete Surfacing Machinery Co.
4665-4669 Spring Grove Avenue Cincinnati 32, Ohio

In any in-place STABILIZATION — anyplace YOU'LL GET GREATER EFFICIENCY with the SEAMAN

OKLAHOMA
Construction of bituminous highway with SEAMAN TRAV-L-PLANT.



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Gravel stabilization. SEAMAN blends and proportions gravel, corrects segregation.

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Two SEAMAN Self-Propelleds mixing bituminous bound-gravel on 2 lane highway. Each lane 25' wide, 16 miles in length.

GEORGIA
SEAMAN Deep-Mix Pull-Type Model (D-67) mixing 18" compacted depth.

FLORIDA
Parking area, Pinecastle Air Base. Stabilized limestone and sand. Model D-67.

SEAMAN TRAV-L-PLANT. Equipped with pump, tachometer assembly and spray bar for bitumen or water. Volumetric meter optional. 7 ft. mixing width. Gasoline or diesel powered.

VIRGINIA
Cross-Mixing with two SEAMAN Self-Propelleds blending out irregularities in aggregate size.

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Self-propelled follows distributor closely to prevent migration.

ARIZONA
SEAMAN Self-Propelled in shoulder stabilization.

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SEAMAN TRAV-L-PLANT mixing for bituminous shoulders.

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SEAMAN Self-Propelled in sand-clay stabilization.

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The SEAMAN MIXER provides a uniformly blended, finished mix at a far lower cost per yard. Its high production—an average of a mile of road per day—puts your schedules ahead of time, minimizes losses from downtime due to weather.

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Roadside Plans Put Erosion Control First

Golden State Finds Place for Esthetic Values, Too, But Utility Ranks First on California Roadsides

• CALIFORNIA'S roadside-improvement program is on the sound basis of erosion control first. After that come considerations of driving ease, safety, and beauty. The program always considers first things first, if only from the viewpoint of hard-headed self-interest.

For example, when a shifting slope is planted to stop erosion, lowered maintenance costs are what H. Dana Bowers, the Division of Highways Landscape Engineer, has in mind. Oleanders are being planted by the thousands along the medians of California's ultramodern limited-access divided highways, and while the scarlet-flowered bushes will undoubtedly be beautiful, their primary purpose is to reduce headlight glare from opposing traffic at night. In this case traffic safety ranks ahead of esthetics.

As a matter of fact, this attention to first things first has raised a problem of considerable interest. Under the Collier-Burns Highway Act, the State surveyed its long-range highway needs and is currently engaged in the construction of a modern limited-access highway system, along with other state roads. Many of these beautiful four-lane divided highways pass close to sizable towns and cities. Over the years, district engineers have often found that extensive landscaping will sell many people on the general efficiency of a highway department. As a result of this policy, many requests come in from the districts for the ultimate in landscaping.

But landscaping in California means seed and cuttings and transplanting and water systems and fertilizer and soil preparation, all because of the peculiar climatic conditions of the state. These things cost money. Moderate landscaping in the form of eucalyptus trees—which usually grow without an artificial irrigation system—is much more sensible, especially when it is combined with natural erosion-resistant ground cover. Because the latter method is more nearly in line with fundamentals, it is generally followed.

And on major freeways, like the Hollywood Freeway in Los Angeles, the encroachment and abuse by advertising signs has recently become so serious that a policy has been adopted to landscape metropolitan freeways only where local ordinances provide adequate protection of the landscaping investment from indiscriminate advertising practices.

If any roadside-improvement program or project in California is carefully examined, erosion control will be found somewhere in the work. Virtually 90 per cent or more of the work is aimed at erosion control of some type. Erosion is considered on cut slopes, on fill slopes, on highway shoulders, in drainage channels, as it relates to wind, ground cover, and fire prevention. The sum of experience gained over the years has recently been put together in a booklet titled "Erosion Control on California State Highways". Detailed and practical, it contains much information that is of value to the roadside engineer.

The ever-increasing importance of roadside considerations as a part of California's regular highway program is seen in the following tabulation of money spent for roadside development, including preparatory work, planting, and erosion control:

Year	Biennial and Annual Budgets
1933-35	$125,236.64
1935-37	305,077.33
1937-39	164,110.53
1939-41	381,146.56
1941-43	92,279.97
1943-44	5,281.24
1944-45	0.00
1945-46	403,852.66
1946-47	442,414.40
1947-48	714,912.29
1948-49	352,529.56
1949-50	327,688.13

Climatic Conditions

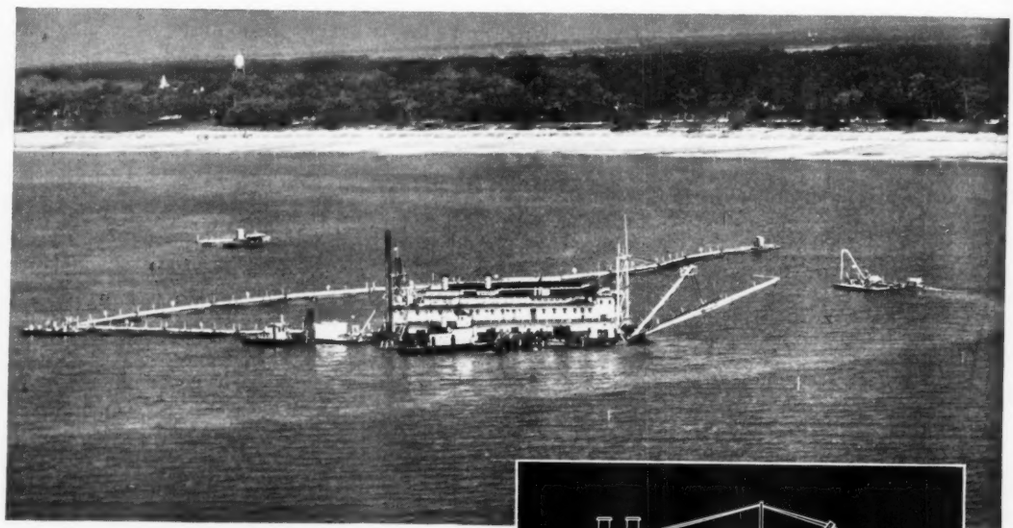
The complexity of California's roadside program is due largely to one of the most variable climates found anywhere. The state is close to 1,000 miles long, from north to south, and it stretches all the way from the humid forested zone characteristic of the Pacific Northwest to arid northern Mexico. Elevations range from below sea level to more than 14,000 feet. To meet the many types of climate many different types of erosion control have been found necessary.

Generally speaking, rain falls only during the later fall months, winter

Ray Day Photo

Workmen plant oleander bushes on the median of U. S. 40 east of San Francisco to deflect light glare from opposing traffic.

What's U. S. Rubber doing to build the world's largest man-made beach?



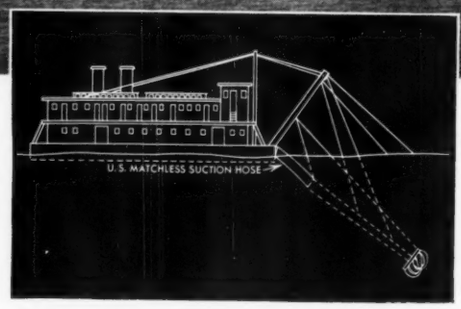


Photo shows dredge pumping sand to make the artificial beach on the Mississippi shore. It extends approximately 1500 feet into the stream. The diagram shows the cutter head which stirs up sand and silt. This in turn is drawn through the pipe, then through the U.S. Matchless Suction Hose to the pump and through the discharge line.

The dredge which has thus far sucked out over 6 million cubic yards of sand to build the 26-mile long beach from Henderson Point, Miss., to Biloxi, Miss., is equipped with U.S. Matchless® Hose. This tremendous job also includes the pumping of an additional 6 million cubic yards of river silt, sand and mud through this same hose. The sloping bathing beach, when finished, will also provide a defense for the sea wall in abnormally high tides. The "U.S." Hose, acting as a flexible connection between the cutter head and the dredge, is still in good condition and has plenty of service life left, despite its rugged treatment. No matter what your hose problem may be, consult United States Rubber Company.

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and spring, with the greater part of the yearly total coming in the form of rains of high intensity during the months of December, January, and February. March and October may or may not be wet. Little or no rain falls from April to September.

The yearly rainfall varies strikingly. Highest rainfall occurs in the vicinity of Crescent City, in the northwest corner of the state, where the 20-year average is 72 inches. Lowest figures are found in the southeast corner in the Imperial Valley, where only 2.44 inches is the yearly average. In general, the northern part of California receives an ample supply of rain, the quantity decreasing rapidly in the interior valleys to the south; more slowly along the coast and in the Sierras. San Francisco's yearly average is 23 inches; Sacramento, 19 inches; Tahoe, 31 inches; Los Angeles, 15 inches; and San Diego, 10 inches. This pattern is often varied by high mountains. For example, Mount Wilson receives 31 inches of rain per year while Pasadena, at its base, gets 18 inches.

The record rainfall intensity on the North American continent has been recorded in California. During a one-minute period, 1.02 inches fell near Mount Wilson. Rainfall intensity often belies the annual figures, and intensity is something which erosion-control engineers must consider seriously.

Since soil moisture is depleted during the dry summer, the growth of annual vegetation follows the rainfall pattern. The growing season starts with the first rain of the season, whether it comes in October or January. It then continues through the winter and spring, and all but the most drought-resistant plants die when soil moisture is no longer available. A light early rain, which starts the growth of annuals, sometimes results in the death of the first plants if it is followed by a dry period. A second crop then germinates after the next rain.

From an erosion-control standpoint, these weather variations leave something to be desired. When the first rain of the season is moderate in intensity and deposits sufficient moisture to germinate seed and keep it growing, there is a good chance that an adequate vegetative cover will be established before the heavy rains come. But if the first rain of the season is late and heavy, the protection offered by the dead remnants of the previous season's growth is often inadequate, unless an ample root mat has been formed, and then soil loss takes place.

Many Erosive Soil Types

Back in 1937, 259 separate and distinct types of soil were classified in California by the U. S. Department of Agriculture. No doubt more will be found as time goes by, but that variety shows how complex the erosion-control phase of roadside development really is.

Many or most of these soils are sedimentary in origin. Geological upheavals shoved these formations skyward, ages ago. The formations then eroded in their turn, and re-eroded. One of the things roadside engineers have noticed particularly is the fact that these sedimentary soils are extremely erosive after Mother Nature has rehandled them several times in this fashion.

But the sedimentary formations have no monopoly on erosive tendencies, bad as they are. Much of the severe damage from storm erosion is due to erosion in disintegrated granite, an igneous formation. Huge slides and "mud waves" of this material during the past rainy season bear mute evidence to the problem faced by roadside engineers when highways pass through this formation.

Disturbed Slopes Erode Faster

Roadside engineers often examine the angle of repose and soil variety on undisturbed slopes and conclude, from their findings, that a disturbed slope of the same material will stand up equally well. Bowers and his three-man staff now realize that this is not so. The angle of slope and the composition of subsoil may be identical, yet the disturbed slope loses large quantities of soil with every rain while the undisturbed slope remains unaffected. This is a tough condition, and it is not always simple or economical to duplicate on the artificial slope the good layer of vegetation, grasses, leaf mold or forest duff which so adequately protects the natural slope.

And so it seems obvious that nature must be helped. Soil eroding from new banks causes excessive maintenance cost. The roadside program is designed as a helping hand to nature to make maintenance funds go farther, to make roadside slopes stable, and to make public travel safer.

Calif. Division of Highways Photo

A LeTourneau sheepsfoot roller compacts a roadside bank and beds a straw mulch at the same time in California's erosion-control program.

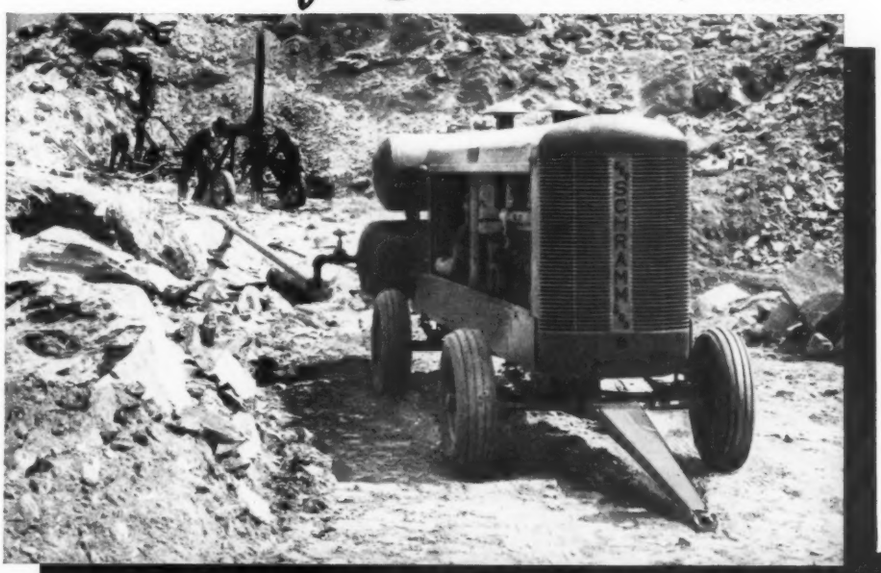
A "Natural" Protection Policy

After long years of experience, California's roadside engineers have come

(*Continued on next page*)

DOUBLE PUNCH

for Extra "Drill Power"



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Roadside Plans Put Erosion Control First

(Continued from preceding page)

to the conclusion that the only effective erosion control is the kind provided by Mother Nature. A clear policy in this regard is defined in the "Conclusions" section of the erosion-control booklet, which says:

"The most successful erosion-control methods have proved to be those which reproduce most closely conditions which are found on natural slopes. Mechanical or unnatural methods of control, while sometimes immediately effective, deteriorate with time and show up poorly in the long run as compared with methods that follow natural vegetative processes. If we work with nature, erosion-control problems are simplified and . . . success becomes more certain than if we disregard the examples of successful natural stabilization to be found on every hillside, and proceed to attack the problem from a mechanical angle.

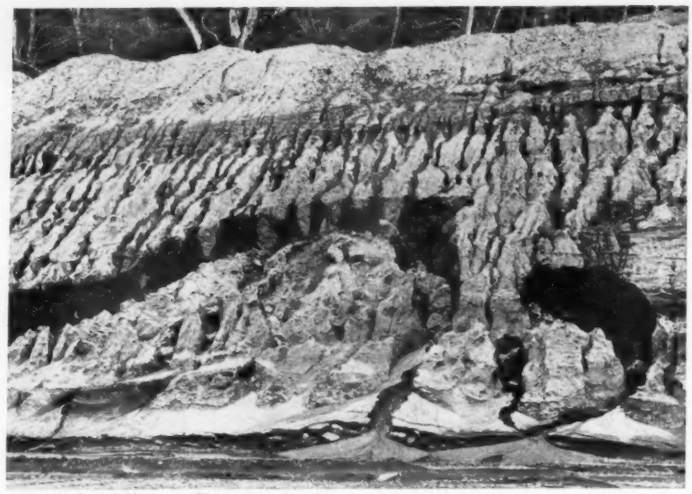
"By artificially speeding up the stabilization process, thereby creating conditions in one season which nature could not duplicate in several years, we find we can shorten the time required for complete control.

"Much of the value of slope-stabilization treatment is lost unless proper maintenance can be given during the all-important first and second years after installation, and as required thereafter. Cost of timely maintenance is not high, but neglect can bring about increased and unnecessary expenditures due to the necessity of cleaning gutters and repairing gullies which threaten the traveled way, and of frequently rebuilding portions of roadways at fill locations.

"Highway construction standards now encourage the use of flatter slopes in erosion-prone soils. Flatter slopes allow the use of thicker blankets of topsoil which can support a more vigorous growth of vegetation without tending to slump when saturated. Control problems are eased considerably, and the need for maintenance reduced.

"As new successful erosion-control projects are completed and the consequent reduction in maintenance cost for repair of erosion-caused damage becomes more evident, highway employees are taking a greater interest in the program. Highway engineers have been particularly cooperative in developing methods which would be both practical and effective, and highway maintenance forces have become more conscious of the value of prevention. There is still a decided need for continued educational work, however, especially in regard to effective methods for repair of old eroded slopes, and it is believed that eventually this work will be done as a matter of course.

"Experimental work will be continued. Even though we feel that considerable progress has been made, too many questions remain unanswered and too many partial failures result from high-intensity rains to allow us to believe that the most effective methods have yet been developed."



Calif. Division of Highways Photo

Prompt erosion-control measures are important. This slope had not even been finally accepted when the storm hit.

Small Roadside Organization

The entire roadside program in California is handled by Bowers and his three hard-working assistants: a remarkable fact when one considers the size of the state and the magnitude of the program. With a small headquarters office at 1105 O Street in Sacra-

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Today, more and more Big Red Teams are working in fleets. One of these Bucyrus-Erie Scraper and International TD-24 Tractor combinations sells another — and another, and another. Why not do as others have — see for yourself that B-Type Scrapers *load faster, in shorter distance* — that they get *bigger loads* with or without pushers — that they *haul more dirt, move it cheaper.* Ask your International Industrial Tractor Distributor for details.

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Five Bucyrus-Erie B-250 Scrapers pulled by International TD-24 Tractors excavating at steam plant site in Tennessee.

Six B-type Scrapers and TD-24's on strip mining in England.

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B-250
22 yd. struck, 27½ yd. heaped capacity.

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mento, the staff covers the state so far as preliminary work, drainage determination, planning, and landscape construction are concerned. Regular construction inspectors have a part in the roadside planting contracts, too, and the tremendous 400,000-acre roadside maintenance program is administered by men in the Maintenance Department under George Hellesoe. But Bowers and his three-man staff are always somewhere close, regardless of the job location. Especially, they are available when troublesome cases develop. One of their specialties is the examination of erosive conditions in the field, and a quick prescription for treatment.

A 4-acre nursery, staffed by five men, is also maintained on U. S. 40 about 5 miles west of Sacramento. In this nursery are raised many of the potted and banded shrubs and trees which eventually find their way to roadside planting programs. The thousands of oleanders which now are needed for the median planting program are being raised largely in this nursery.

Bowers emphasizes that the State-owned nursery is not maintained with the idea of competing with private nurseries, and he is first to admit that its costs cannot compete with those of private establishments. The state nursery is planned only to grow large quantities of plants not available commercially; for example, it turns out thousands of oleanders of the same size for the planting program.

Meanwhile, Bowers and his staff continue to sell their roadside program on the basis of soundness and economy. To do that, the program has now taken on somewhat of a "resistive" nature, especially on metropolitan freeways where self-supporting eucalyptus and native plantings will do, but where expensive landscaping and sprinkling facilities are often sought by local groups.

Space does not permit publication of the myriad valuable details of the many types of roadside erosion-control maintenance, prevention, and repair in California, but all have been worked out successfully and are detailed in the booklet "Erosion Control on California State Highways", copies of which are available to any highway department.

New Copying Machine

Finished copies of any office record up to 14 inches wide can now be made in less than a minute without developing, washing, fixing, or drying. According to its manufacturer, the light and compact Copyfix takes not much more space than dictating equipment. No special installation is required—the machine operates after being plugged into any electrical outlet. No darkroom is needed.

Place the record to be copied face to face with a sheet of Copyfix negative paper on the printer, and expose. Remove them from the printer and place the exposed negative paper with a sheet of positive paper in the printer. In about ten seconds, the two sheets will emerge from the rear slot of the machine. Peel them apart and you have a positive copy for immediate use.

The Copyfix makes copies of any office record up to 14 inches wide. There is no developing, washing, fixing, or drying. No darkroom is needed.

Further information may be secured from Remington Rand, Inc., 315 Fourth Avenue, New York 10, N. Y. Or use the Request Card at page 16. Circle No. 624.

Book on Metal Processing

A guide to the proper selection, use, and processing of metals—"Metallurgy for Engineers: Casting, Welding, and Working"—has been published by John Wiley & Sons, 440 Fourth Ave., New York, N. Y. Written by M. I. T. professors John Wulff, Howard F. Taylor, and Amos J. Shaler, the new book explains the concepts and principles that underlie metal processing and follows with an intensive discussion of the processes themselves. Special attention is given to the solidification of metals and how the principles of metallurgy are applied to design and fabrication.

Topics included are: the structure and properties of metals; the solidification of pure metals; impurity and solubility; phase equilibrium and alloy systems; heat treatment of steel; sand casting; corrosion gating and risering; and powder metallurgy.

The book contains 624 pages and is priced at $6.75.

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The striking steam plume shown in this photo is from the famous Madsen dust wet tube air dust washer

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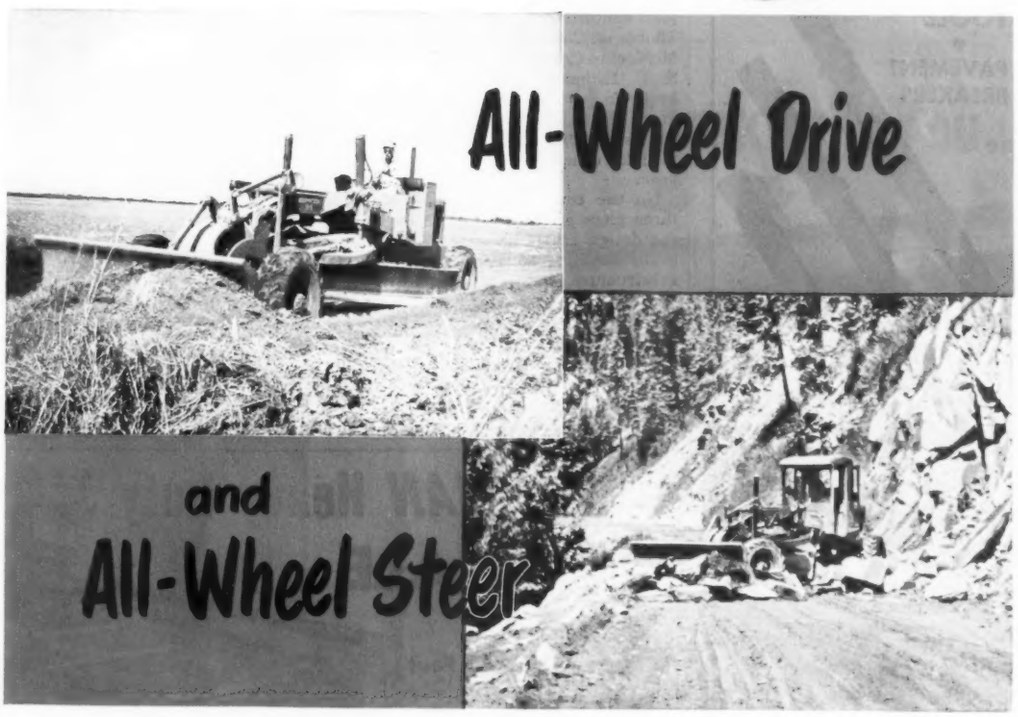

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Fast . . . easily operated by smooth hydraulic control . . . never in the way on other work . . . the Bulldozer is an excellent example of the fact that any attachment—front, center or rear mounted—is doubly effective on an Austin-Western Power Grader, thanks to exclusive All-Wheel Drive and All-Wheel Steer.

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SINCE 1859—BUILDERS OF CONSTRUCTION EQUIPMENT

Railroad Rebuilds Savannah River Span

Change in Channel Necessitates Replacement of Bascule by Vertical Lift; Traffic Maintained During Work

By WILLIAM H. QUIRK,
Editor

• A TRICKY and painstaking bridge reconstruction is in progress at Savannah, Ga., where the Seaboard Airline Railroad Co. is replacing its bascule span over the Savannah River by a vertical lift. The project was occasioned by a Federal program for widening the river channel and shifting its position from the original location, close to the right bank or Savannah side, out into the middle of the river. The channel will be widened from 116 feet to a 200-foot horizontal clearance between fenders.

Located upstream from the city, the river crossing carries the main freight line of the railroad on the water-level route between Savannah and Charleston, S. C. At this point islands divide the Savannah into two branches—Front and Back Rivers. The channel is in Front River, the southern branch, which flows past the Savannah waterfront. The crossing of Back River is not affected in the improvement.

A timber trestle carried the single-track line out from the island on the north or left bank to the first pier of the original bridge. A 164-foot truss covered the distance to the second pier, while to the third pier the span was only 28 feet 9⅝ inches. The single-leaf bascule rested on these two nearby piers, and extended 131 feet across the original channel to pier 4. The length of the old bridge totaled 323 feet 9⅝ inches.

New Bridge

Designed by Howard, Needles, Tammen & Bergendoff, consulting engineer firm of Kansas City and New York, the reconstruction is being done under a joint venture by two contractors—C. Y. Thomason Co. of Greenwood, S. C., and McMeekin Construction Co. of Cheraw, S. C. Estimated cost of the project, borne in part by the Federal government, is $1,700,000. Work started in August, 1950, and the project is scheduled for completion by the end of this year.

No use could be made of the first three piers of the original bridge, but the design called for pier 4, near the south bank, to remain as part of the substructure for the new bridge. Early in the work, however, a ship hit the pier and dislodged it from its footing. The contractors drove piles for temporary bents up and downstream of the damaged pier, and laid a truss across them to take the load of the span. This arrangement served its purpose, but a new pier 4 is being constructed at the same location to replace the original one that was struck.

The new bridge has a total length 586 feet. The timber trestle from t north now ends at new pier 1, loca

This general view looking north shows the old bridge's bascule span and the batch plant on the north shore of the Savannah River.

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LINE OF CONTRACTORS TOOLS
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DEMOLITION TOOLS
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PAVEMENT BREAKERS

All STRUCTO tools are made in the modern Arrow shops by skilled tool makers using only the finest quality steel.

In addition to the tools shown above the STRUCTO line includes air hammer tools, star drills, drift pins and pull pins. All are available in a wide variety of sizes and weights.

Every STRUCTO tool is backed by 37 years experience in making fine tools, plus a generous amount of good service to customers.

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Light weight. Easily installed in hose line or on bench. Streamlined to prevent catching. No moving parts to get out of order. 4 sizes. Order from your equipment dealer TODAY, or write us for leaflet and prices.

Dealer inquiries invited.

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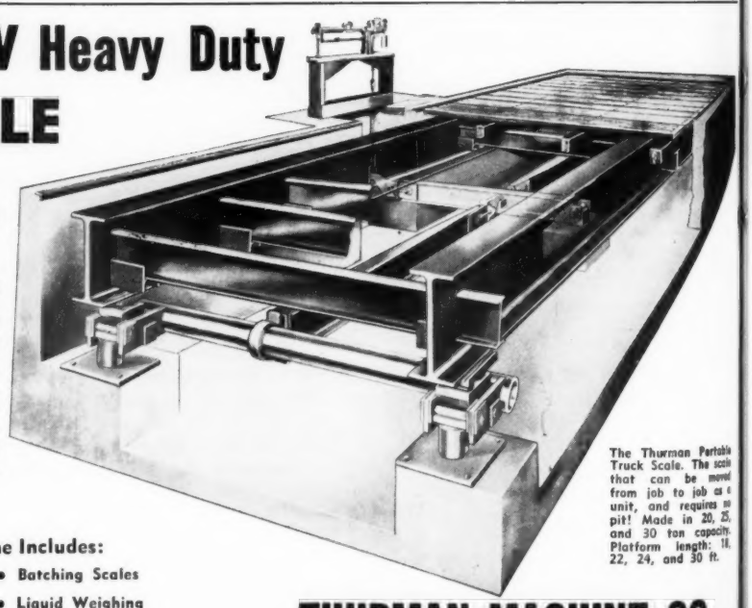

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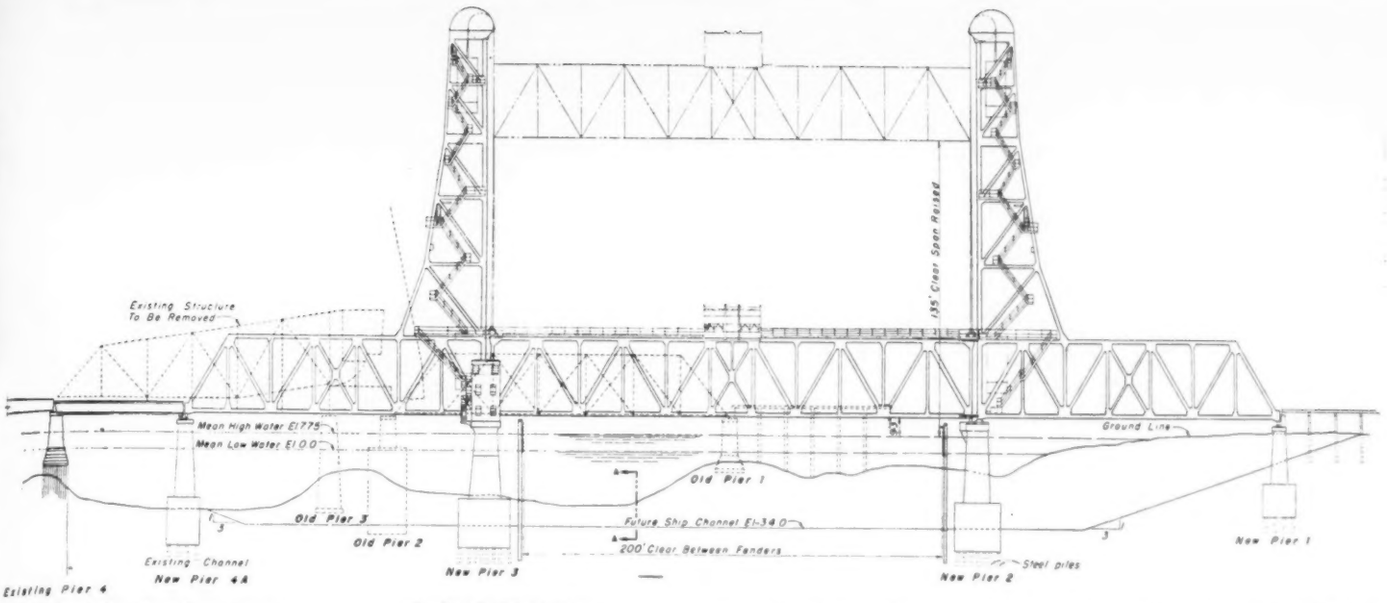

well back of the shore line. From pier 1 to pier 2, out in the river, the span is 144 feet 9 inches. The main lift span of 235 feet lies between piers 2 and 3. From 3 to 4A, also a new pier, the span is 145 feet. These three spans are through trusses, 34 feet in depth, with their working lines 20 feet apart on centers. The last and southernmost span of the reconstruction is 61 feet 3 inches from pier 4A to pier 4. It consists of two deck girders, 7 feet apart on centers, and 5 feet 6½ inches deep back to back of angles.

Traffic Is Maintained

In general, the contract called for the reconstruction of a portion of the existing bridge by removing steel spans, timber trestles, piers, fenders, and other parts, and replacing this portion with a new structure complete and ready for railroad traffic and operation. All this was to be done without interruption to rail or river traffic.

To meet these requirements, the contractors built piers 1, 2, and 3 in that order. Then the Virginia Bridge Co. of Roanoke, Va., subcontractor on the structural steel, erected the superstructure for the tower span between piers 1 and 2, and the vertical-lift span between piers 2 and 3; also the towers at piers 2 and 3 which are 178 feet high measured from the bottom chord to the center line of sheaves at the top. The vertical-lift span is suspended by wire ropes which pass over these sheaves, and connect to steel-encased concrete counterweights.

At this point the old bascule span and the new vertical lift were both functioning. Obviously pier 4A and the span to it from pier 3 could not be built until the new lift over the future ship channel was working. Once the lift was ready and the new channel dredged out for river traffic, the bascule was closed and pier 4A was constructed. A temporary anchorage of steel piles had been driven just south of new pier 3, to tie down the south or Savannah-side tower of the lift span until the new truss was erected for the tower span between piers 3 and 4A.

Pier 4 at the south end of the new

(Continued on next page)

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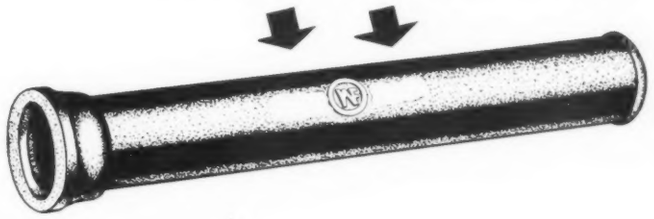

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95 Years of Continuous Service

Railroad Rebuilds Savannah River Span

(*Continued from preceding page*)

bridge was also rebuilt, thus permitting the Virginia Bridge Co. to move back in again and erect both the final truss span and the girder span. After that the general contractor completed the fender-pile system. Existing fenders at the sides of the channel through the bascule span were removed, and new fenders were provided at the sides of the new channel through the vertical-lift span.

Same Alignment

While the new piers of the bridge do not coincide in location with the original piers, both the old and new alignment are the same. This raised the tricky problem of building piers directly under a bridge over which long freight and some passenger trains passed every day. Temporary falsework was driven at the side of the bridge,

Floating rigs drive piles at pier 3 on the Savannah River bridge job. The old truss is still in place in this picture.

is at elevation 13.65. At one side of the pier at the top is an extension for the bridge operator's house, 10 x 14 feet and three stories high.

Pier 2, the next largest, has a 15-foot seal, a 7-foot footing, and is 22 x 40 feet, with a bottom elevation of minus 44.0 and its top at 13.6. It is supported on 112 piles 50 feet long. The shaft is 12 feet 8½ inches x 32 feet 8½ inches at the bottom, and 10 x 30 feet at the top. The cap is 3 feet 1½ inches deep, and measures 11 x 31 feet.

Pier 4A on 52 piles, 50 feet long, has bottom and top elevations of minus 44.0 and 13.7 respectively. It has a 15-foot seal, a 7-foot footing, and measures 16 x 40 feet. The shaft is 9 feet 10 inches x 29 feet 10 inches at the bottom, 7 x 27 feet at the top, and is surmounted by a cap 8 x 28 x 2 feet deep.

For pier 1 only 40 piles, 40 feet in length, were required to support the 16 x 37-foot substructure which has a 10-foot seal and a 5-foot footing. The bottom goes down to minus 28.0, while the top is at 13.7 elevation. At the bot-

permitting sections of track, 41 feet in length, to be shifted back and forth on rollers as much as 3 feet during the construction of a pier. This 3-foot movement gave the flexibility necessary for the speedy placing of concrete within the cofferdams.

To provide access to pier 3 during its construction, the southerly half of the existing 164-foot truss between old piers 1 and 2 was removed. The track was supported on falsework. The northerly half of the truss was left in place to stiffen the falsework. To get concrete from the plant on the north shore out to pier 3 in about the middle of the river, the contractor erected a work trestle on the downstream side of the bridge. Cars carrying 1-yard buckets of concrete operated over a track laid on the trestle. Motive power was supplied by an endless cable actuated by an engine on shore.

Piers on Steel H-Piles

All the piers are supported on Bethlehem 12-inch 74-pound steel H-piles which extend through the seal and 2 feet into the footing. Pier 3 is the largest, measuring 25 x 58 feet with a seal 15 feet deep and a 7-foot footing over that. It rests on 152 piles 50 feet long, and goes down to minus 44.0 elevation. Above the footing is a shaft, 15 feet 5 inches x 35 feet 5 inches at the bottom, and 10 x 30 feet at the top, which

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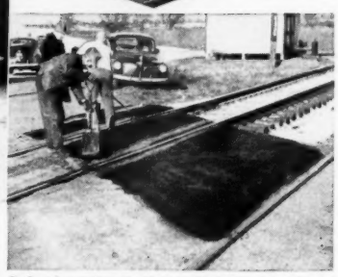

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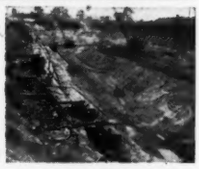

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tom the shaft measures 8 x 29 feet, while at the top it is 6 x 27 feet with a cap that is 7 x 28 x 2 feet in depth.

Concrete Batch Plant

In preparation for placing the 4,500 cubic yards of concrete in the substructure, the contractor set up a concrete batch plant on the north shore close to the bridge. A 200-foot spur track, long enough to accommodate four cars of materials while unloading, was laid out on a trestle that was erected off the main line. A cement-storage shed was built on piles to the level of the trestle, to hold the 6,500 bags of Atlas cement.

Sand and stone for the aggregate came from the Coastal Sand Co. of Johnsonville, S. C., and Weston-Brooker Co. of Columbia, S. C., respectively. Hopper-bottom cars unloaded the material from the elevated spur track down to the ground where a Northwest crane with clamshell picked up the aggregate and charged a Blaw-Knox storage bin. Reinforcing steel from the Virginia Steel Co., Inc., of Birmingham, Ala., was stored in the yard adjoining the plant. Water for the mix was pumped from a sump hole in the ground by a Jaeger 4-inch Sure Prime pump, and conveyed through 2-inch pipelines to each of the two pavers that mixed the concrete.

From four to six batch trucks, carrying one batch each picked up the aggregate under the storage bin, continued along under the cement shed, and from there went to the pavers—a MultiFoote and Koehring 27-E—that were set up on the north shore on each side of the bridge. They discharged into 1-yard concrete buckets that were handled by cranes. In pouring pier 1 the cranes worked on shore, while for pier 2 one reached out to the pier from a work trestle on the upstream side, while the other was set up on a barge.

Built Within Cofferdams

Piers were constructed within sheet-pile cofferdams consisting of 60-foot lengths of Carnegie-Illinois M-110 sections that were driven by a Vulcan No. 2 hammer. For floating equipment the contractor had two barges, one 30 x 100 feet and the other 34 x 55 feet, on which were mounted Northwest cranes; and a 30 x 100-foot derrick barge with a 50-ton capacity. Materials were transported on two 24 x 80-foot barges.

Pier 3 had the biggest cofferdam, with five horizontal rings and cross struts to brace it, the lowest being 2 feet below the top of seal, and the rest at 10, 5, 10, and 11-foot spacings respectively above that. The H-piles were driven by a Vulcan No. 1 hammer working in 35-foot leads. The seal was poured from tremie pipe, after which the cofferdams were unwatered by three Jaeger pumps—one at 10-inch and two at 8-inch. They were kept dry by smaller 4-inch pumps.

Forms for the shafts were built with ¾-inch lumber backed with 2 x 6 studs on 12-inch centers and double 2 x 6 wales on an average 24-inch spacing. The panels were held together with Richmond tie screws. As the concrete was placed it was vibrated with Master vibrators, and water was used in the curing. The average production was 50 yards an hour. Sheeting for the cofferdams was pulled by Vulcan 800 extractors, and used over again for the next pier.

The paver in the foreground produced concrete for pier 3. The concrete was carried out in 1-yard buckets on cars that operated over the downstream work trestle.

Dredging

The existing channel averaged 28 feet in depth, but the new channel is 34 feet below mean low water for a 200-foot horizontal clearance at the lift span. When the lift is in the raised or open position it has a vertical clearance of 135 feet above mean high water which is at elevation 7.75. The contractor is responsible for dredging the channel up and downstream 50 feet from the bridge, while the Federal government dredges the rest of the channel in the river.

Quantities and Personnel

The major items in the bridge reconstruction contract include the following:

Pier excavation	4,300 cu. yds.
Channel excavation	42,000 cu. yds.
Steel H-piles	17,000 lin. ft.
Pier concrete	4,500 cu. yds.
Reinforcing steel	37 tons
Structural steel	1,463 tons

(Concluded on next page)

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Railroad Rebuilds Savannah River Span

(*Continued from preceding page*)

The contractors—C. Y. Thomason Co. and McMeekin Construction Co.—employed an average force of 25 on the project under the direction of William A. Prather for the first phase and R. A. Mitchell for the last phase.

For the Seaboard Airline Railroad Co., John E. Hutto is Resident Engineer, assisted by A. W. Cooper.

The U. S. Army Corps of Engineers, Savannah District, is represented at the site by Thomas H. Freeland.

Reid Becomes District Mgr.

The Goodyear Tire & Rubber Co., Akron, Ohio, has announced the appointment of J. L. Reid to the post of District Manager of its mechanical goods sales at Salt Lake City, Utah. He replaces W. T. Roberts who retired last July after 32 years with the firm.

Loading and Hauling Two-Wheel Equipment

A method of loading and hauling heavy 2-wheel equipment that keeps within legal weight limitations has been developed by Martin Machine Co., Kewanee, Ill. It involves the F4T-21, which is a variation of the Martin folding-gooseneck trailer. Removable wheel chocks have been added to the platform and the rear kick-up has been redesigned for proper clearance and load distribution.

During tests with the Caterpillar DW21 tractor and No. 21 scraper unit, the folding gooseneck of the trailer was lowered and the front chocks removed. The tractor-scraper pulled alongside, with the tractor slightly ahead of the front end of the trailer. The tractor was then backed onto the wide platform, jackknifing the scraper until the drive wheels rested against the rear chocks. The front chocks were secured in place and the winch-equipped truck-tractor raised the gooseneck to hauling position. When the truck and trailer drove away, the body of the scraper swung over the back end of the trailer and the rear wheels of the scraper trailed behind.

A tandem-axle truck-tractor must be used, the company points out. The axle load on the truck-tractor and trailer tandem is well distributed to stay within the 32,000-pound load limitation allowable in most states.

The Martin F4T-21 trailer enables contractors to "road" their heavy two-wheel earth-moving equipment and still stay within legal load limitations.

Having a standard 8 x 14-foot platform, the F4T-21 enables contractors to haul other equipment ordinarily hauled on low-bed trailers. The trailer frame is constructed of wide-flange electrically welded structural-steel beams. The gooseneck lowers to form a ramp with a 4-degree slope. The platform is seasoned hardwood and tires are 12-ply 9.00 x 15.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 614.

Vermont Engineering Course

Due to the serious shortage of college-trained engineers, the Vermont State Highway Department conducted the first of a projected series of courses in practical engineering last July. The fourteen students—all high-school graduates who were unable to attend college—studied mathematics and surveying.

The aim of the intensive four-week course was to provide a basic knowledge of the engineering principles used in highway operations. Those students who successfully completed the training went on with actual field and office work under the Department's engineering staff.

According to Chief Engineer H. E. Sargent, during the past 25 years some of the Vermont Department's most qualified design and construction men have started from high school without formal engineering degrees.

B-K Div. Personnel Changes

Three personnel changes have been made in the Construction Equipment Department of the Blaw-Knox Division of the Blaw-Knox Co., Pittsburgh, Pa., manufacturer of construction and road-building equipment. L. J. Sarosody has relinquished his post as Chief Engineer of the Department in order to devote full time to his job as Manager and Chief Engineer of the Steel Forms Department. He will, however, serve as engineering consultant on construction equipment.

C. F. Mittelstadt has been promoted from Assistant Chief Engineer to Mr. Sarosdy's former post as Chief Engineer. S. M. Pare, who has held several positions in the Department in the past 22 years, becomes Assistant Manager.

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Note the arrangement of intake ports on this unit cylinder head and liner assembly for a P&H Diesel. This entire area, including the spaces between ports, is fully water-jacketed to insure uniform cooling. No other 2-cycle diesel in this horsepower range controls temperatures throughout the entire stroke of the pistons!

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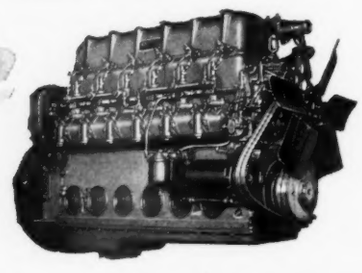

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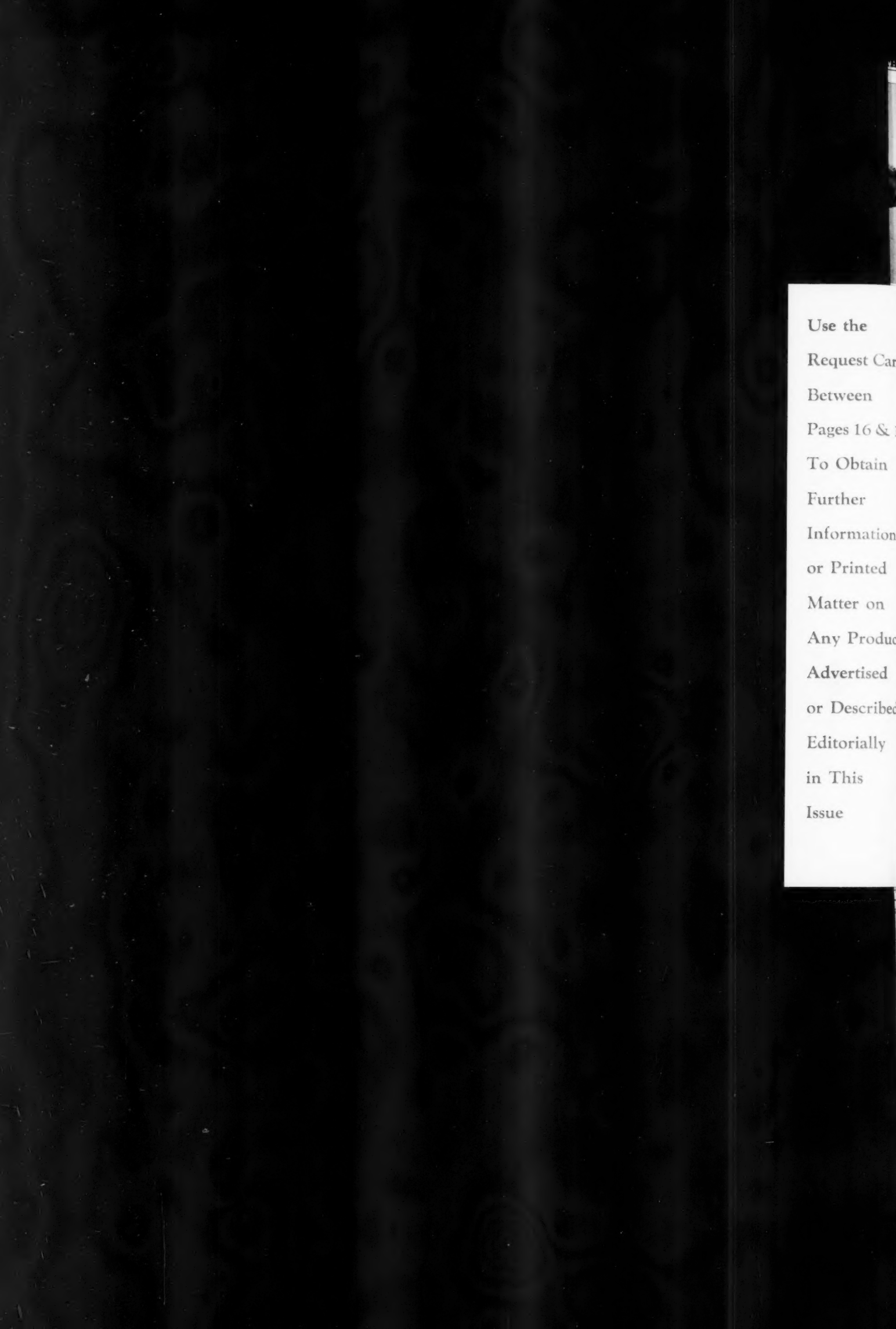
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The figures on the Lufkin tape are an integral part of the steel and they won't wear off.

New Model Steel Tape

A new model steel tape in 25, 50, 75, and 100-foot lengths is introduced by Lufkin Rule Co., Saginaw, Mich. The Royal Ni-Clad's figures and graduations are made an integral part of the steel to prevent wear.

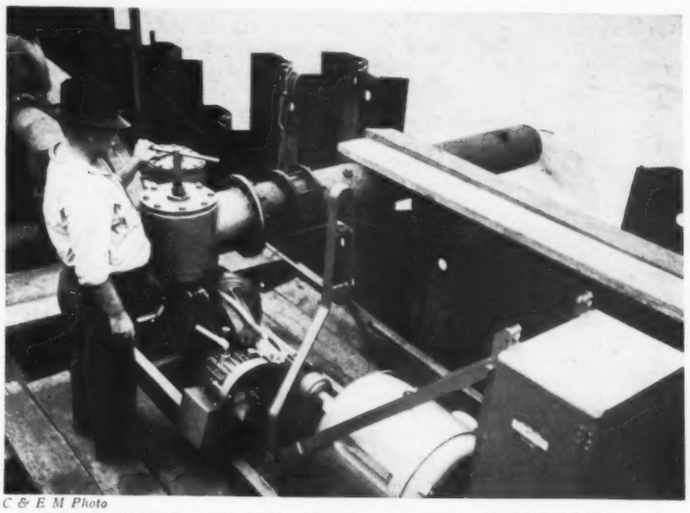
The surface of the tape is nickel-plated and the black markings are said to be easy to read. The rust-resistant welded metal case liner is covered with dark green vinyl. The folding flush handle opens with a push pin.

Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 640.

New Pump Dewaters Behind Sheet Piling

A self-priming centrifugal pump with an automatic priming unit has been introduced by Complete Machinery & Equipment Co., Inc., 36-40 Eleventh St., Long Island City, N. Y.

Poirier & McLane, New York contractor, is using 3 of the 3,500-gpm units to dewater behind a sheet pile wall holding back a 23-foot head of the East River. Generally, the contractor has found that one of the 10-inch pumps with lifts up to 30 feet can keep the water behind the wall low enough to prevent seepage into the adjacent foundation construction. The work is in connection with Consolidated Edison's huge new Astoria Generating Station in Astoria, New York.



C & E M Photo

A workman adjusts flow as a new complete pump keeps New York's East River away from foundation work on the Astoria Generating Station.

The pump has a 10-inch suction and a 10-inch discharge. It is rated as 3,500 gpm at a head of 60 feet. Power comes from a 75-hp 3-phase 60-cycle 220-volt motor with push-button starting.

One of the main features is the vacuum pump-priming mechanism which is V-belt-driven from the shaft of the electric-motor drive. It operates only until priming is no longer needed and then automatically shuts off. For well-point work it can be left on continually to provide priming when enough water has accumulated in the system to permit pumping.

Other features include the air separator chamber to remove entrapped air and the spring-loaded discharge valve which seals the discharge opening from the atmosphere during priming.

The company is also introducing a 3-inch pump with a 350-gpm capacity at 60 head. It is powered by a Wisconsin engine and has the same features as the larger unit. Both can be used as jetting pumps, wellpoint pumps, or straight centrifugal pumps.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 639.

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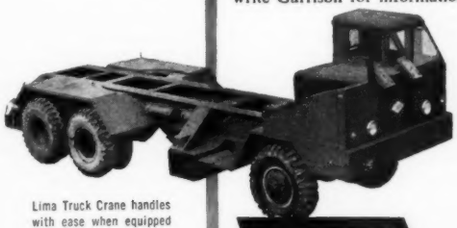
GARRISON HYDRAULIC STEERING BOOSTERS

Let this booster supply steering power! Every day contractors discover power steering increases operator efficiency on trucks, plows, graders and wheel-type tractors; makes turning easy even from a stand-still position; protects the operator and steering mechanism from jolts of rough roads! Operators work longer, more effectively without tiring! Garrison Boosters can be easily installed on most heavy-duty road equipment. Ask your dealer or write Garrison for information.



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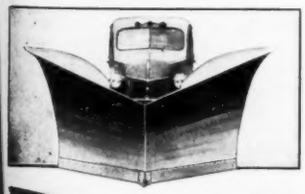

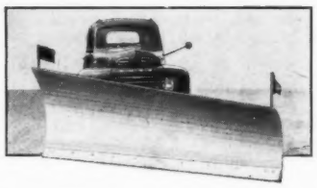

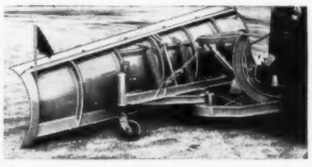

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THE GLEDHILL ROAD MACHINERY CO.
GALION, OHIO

PCA Promotions

A nationally known technician in the concrete-paving field, A. A. Anderson, has been appointed Chief Highway Consultant of the Portland Cement Association. In his new post he will handle special assignments of national importance in the paving field. Mr. Anderson joined the association as a field engineer in 1923. In 1950, he was awarded the Arthur M. Wellington Prize for the most valuable paper on transportation presented before the American Society of Civil Engineers. His headquarters will be the Association's general office, 33 W. Grand Ave., Chicago.

L. M. Arms succeeds Mr. Anderson as Manager of the Highways and Municipal Bureau of the Association.

Trailer-Mounted Floodlight Unit

NITE-HAWK

MAKE NIGHT HOURS PAY with this flexible light and power unit. Four corner-mounted, 80,000 C.P. flood lights raise to 8½ Ft. and aim in all directions. Control panel has duplex receptacles for lines to extension lights and power tools — voltage regulator — circuit breaker — fused circuits — many other features. Tows at highway speeds on heavy-duty trailer with leaf springs and retractable caster wheel. This is the finest, most adaptable unit on the market.
Dependable, low cost 300 to 10,000 watt gas electric plants also available.
WRITE FOR LITERATURE AND PRICES.

Powered by Wisconsin 4 cylinder, air-cooled engine.

WINPOWER MFG. CO.
TEL. 236 NEWTON, IOWA

A feature of the Marmon-Herrington Series 600 truck is the 72-inch-wide cab, which can accommodate three men.

New Line of Trucks

A new line of heavy-duty all-wheel-drive trucks with gasoline or diesel engines is announced by Marmon-Herrington Co., Inc., 1511 W. Washington St., Indianapolis 7, Ind. The 600 Series consists of 5 models with horsepower ranges from 139 to 180 and gross vehicle weights from 24,000 to 33,000 pounds.

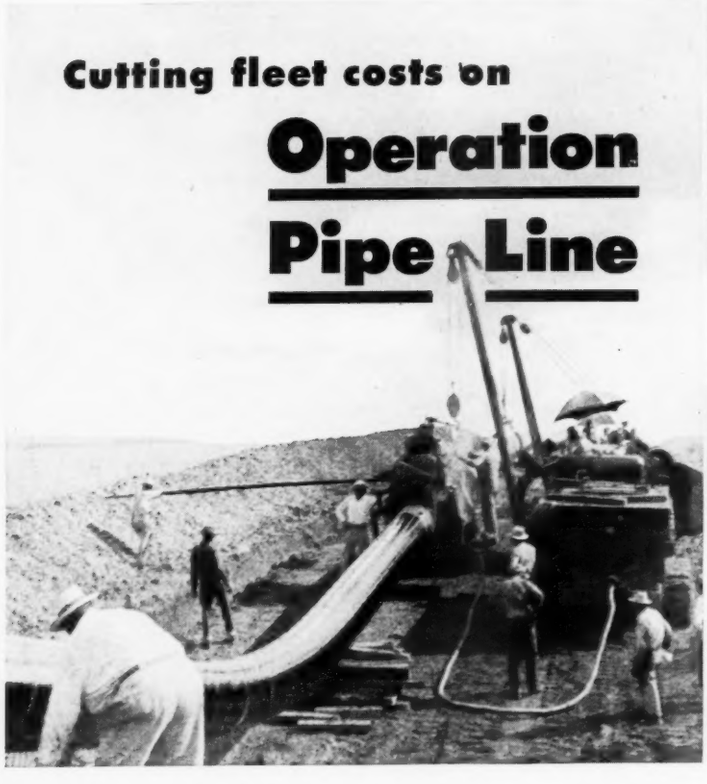
One of the main features of the new line is the wide 72-inch cab with room for 3 men. One-quarter rear windows on both sides provide better vision. Another feature is the bolted front quarter of the fender. For snowplow mounting, this section of the fender is removed, permitting the plow to be set close to the truck for easier steering.

All models are powered by 6-cylinder Hercules engines and have Ross steering systems. They have 5 forward speeds and one reverse.

Further information may be secured from the company. Or use the Request Card that is bound in at page 16. Circle No. 615.

Cutting fleet costs on

Operation Pipe Line



Experience of the hard-working G. G. Griffis Construction Co. shows benefits you can get with . . .

STANOLUBE HD-M
REG. U. S. PAT. OFF.
Motor Oil

. . . on tougher fleet jobs.

• The G. G. Griffis Construction Company, Tulsa, Oklahoma, has a far-flung reputation for tackling the tough jobs and getting them done on schedule. Sparking this organization is its president, Mr. G. G. Griffis who is shown above (left) with Mr. J. R. Welsby of Standard Oil. With 33 years pipe lining experience in all 48 states, Mr. Griffis knows how to get the most out of his equipment. He has this to say about his experience with STANOLUBE HD-M, Standard Oil's new and better heavy-duty motor oil:

"We push our engines hard on all jobs, and they must be able to take punishment. With your STANOLUBE HD-M we have not had to worry about any breakdowns due to faulty lubrication, and that's important when you've got schedules to meet. What's more, our engines have stayed cleaner and in better shape which has cut down overhaul bills."

Make the experience of Mr. G. G. Griffis your basis for trying STANOLUBE HD-M. This new and better additive-type lubricant, combining more effective detergent-dispersant action with greater oxidation stability, will keep deposits and wear at a minimum in all types of fleet engines under the toughest of operating conditions.

Your nearby Standard Oil Office and warehouse stocks STANOLUBE HD-M for fast local delivery. Here, too, is headquarters for your Standard lubrication specialist. Call him today. Or write: Standard Oil Company (Indiana), 910 South Michigan Ave., Chicago 80, Ill.

STANDARD OIL COMPANY
(Indiana)

STANDARD

States Plan a National Good-Roads Association

Five states are on the way to organizing a national good-roads association, and it is hoped that other states will join in as the plan progresses. The original organizing committee, which held its first meeting last month in Washington, D. C., consists of: Ike Ashburn, Executive Vice President, Texas Good Roads Association; Lawrence Rubin, Director, Michigan Good Roads Federation; Edward Konkol, Executive Secretary, Wisconsin Good Roads Association; L. Judson Morhouse, Executive Director, New York Good Roads Association; and G. W. Price, of the Minnesota Trunk Highway Federation and the Minnesota Good Roads Association.

The committee feels that national efforts to solve the serious highway problem have so far been ineffective because of the lack of a specific approach, while state associations need the support which national organizations, and firms of national scope, can give them. The purpose, therefore, of the new National Good Roads Association, is to provide a bridge between state and national efforts, but without superseding any effort now being made for highway improvement. The committee outlines the following tentative aims:

(1) To bring the demand for good roads into focus at the state level—the usual starting point; (2) to help properly qualified state organizations get the cooperation of national organizations and firms; (3) to assist such national organizations and firms to coordinate their better-road efforts with those of state groups; (4) to provide national-level representation for state organizations interested in good roads; and (5) to support the theory of "home rule" for state highway administration. Those member organizations of the National Good Roads Association which are dominated by a truly representative public membership in their own states are to have, in their turn, the dominant voting power in the national association.

The Acting Secretary is L. Judson Morhouse of the New York Good Roads Association, 116 Washington Ave., Albany, N. Y. Address all inquiries to him.

A magnesium Ditch Bridge supports truck wheels during earth boring. Note the center guide which keeps the wheels from running off.

Magnesium Structure For Bridging Ditches

A magnesium support structure that carries truck wheels over ditches and trenches is announced by Magnesium Products of Milwaukee, 748 W. Virginia St., Milwaukee 4, Wis. The Ditch Bridge is 1½ feet wide and comes in lengths up to 10 feet. Two units will sustain a 16,000-pound rear-axle load. Two men can handle the 125-pound bridges. Welded box cells provide a rigid cross section.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 598.

Chesapeake Bridge Used "Potomac" Piers

The opening on July 30 of the 4.3-mile Chesapeake Bay Bridge between Sandy Point and Kent Island, Md. (for construction details, see C. & E. M., Jan., 1952, pg. 19), marked the completion of an important link in the new coastal cutoff expressway which by-passes several major cities. The first leg ends at the new Delaware Memorial Bridge, just below Wilmington—the southern terminus of the New Jersey Turnpike; the second stage, when Maryland's planned north-south highway is completed, will take motorists directly from the Delaware Memorial Bridge to the Chesapeake Bay Bridge, by-passing Baltimore; and from the Chesapeake Bay Bridge traffic will soon be able to feed into the new Severn River Bridge and from there to a new highway which will by-pass Annapolis.

An interesting feature of the Chesapeake Bay Bridge is the use of "Potomac-type" piers. Of the 57 major piers, 36 were constructed by Merritt-Chapman & Scott, New York, N. Y., and of these 28 of the deepest were Potomac-type, so-called because the design was first used for the Potomac River Bridge between Ludlow Ferry, Md., and Dahlgreen, Va. Their general pattern of construction was as follows:

M-C&S first dredged the soft bay bottom to about 3 feet below the designed bottom elevation of the pier, then drove timber piling to support weighted wooden platforms to be lowered into exact position on the bottom. Each platform was perforated with steel-framed openings to mark the precise position of steel H-piles that had to be driven as much as 135 feet to firm sand for a bearing of 130 tons per pile. Raised Roman numerals were nailed next to each opening so that divers could guide the piles by touch; and sight towers (later removed by divers) were erected on top of the platforms to enable survey men to keep them in absolute line as they were sunk.

In order to insure that the batter piles were driven through the timber mat at the correct angle, M-C&S used a gyro-compass, and this is how it worked. An instrument man on the survey platform signaled approximate line and distance; the floating pile driver Cayuga was rotated by a gyro-compass in its hold until the leads matched the alignment shown on the plans; and the pile in its leads was then lowered to within a few inches of the timber mat, where it was guided through its opening by a diver. Before driving, the pile's position got a final check by gyro-compass as well as by instrument from the survey platform.

Roderick M. Hand was M-C&S's Project Manager at the site, and Ben Neuman was Office Manager. William Denny, Vice President in charge of the company's New York Marine & Heavy Construction Division, and President Ralph E. DeSimone directed the project.

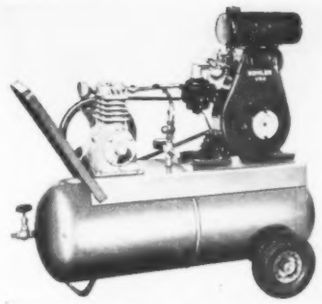
Remember—Safety Is No Accident!

An 8.5-CFM Compressor

A 2-cylinder air-cooled compressor with a displacement of 8.5 cfm is announced by Decker Mfg. Co., 1119 Parmele St., Rockford, Ill. Pressure is adjustable from 50 to 150 pounds. The 300-pound-test heavy-gage steel tank has an 18-gallon capacity.

The unit is powered by a 3.6-hp Kohler engine or by a 1-hp electric motor. It comes with 25 feet of air hose with an air chuck and brass fitting. Semi-pneumatic wheels have 8 x 2.75 tires. The complete unit weighs 200 pounds. Accessories include an air hammer and a suction unloader for spray painting.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 564.



The Decker Model CT-2G3 is a 2-cylinder air-cooled compressor with an 8.5-cfm displacement. Engine or electric-motor-powered, it weighs 200 pounds.

IT'S 3/4 YARDS ALL THE WAY!

It's not just the dipper capacity that rates the Lorain TL-25 as a 3/4 yd. class machine, but the outstanding qualities that are built into it from the ground up. It has the *power* to tear into the job. It has the *speed* of operation and smooth handling that turns out full production. It has the *endurance* to stay in there swinging year after year — and, if servicing is required, its "packaged components" design saves time and money. And when it comes to the *selection* of the right combination of front end and mounting to fit the job, there is no other machine in *any* class that offers so much. Ask your Thew-Lorain distributor to show you a Lorain TL-25 in action. You'll be for it "all the way" too!

3/4 YARD FEATURES YOU'RE SURE TO WANT

- Interchangeable "Packaged" Components
- Complete Package Design — no extras to buy
- 5 Identical Shoe Clutches
- Anti-friction Bearings
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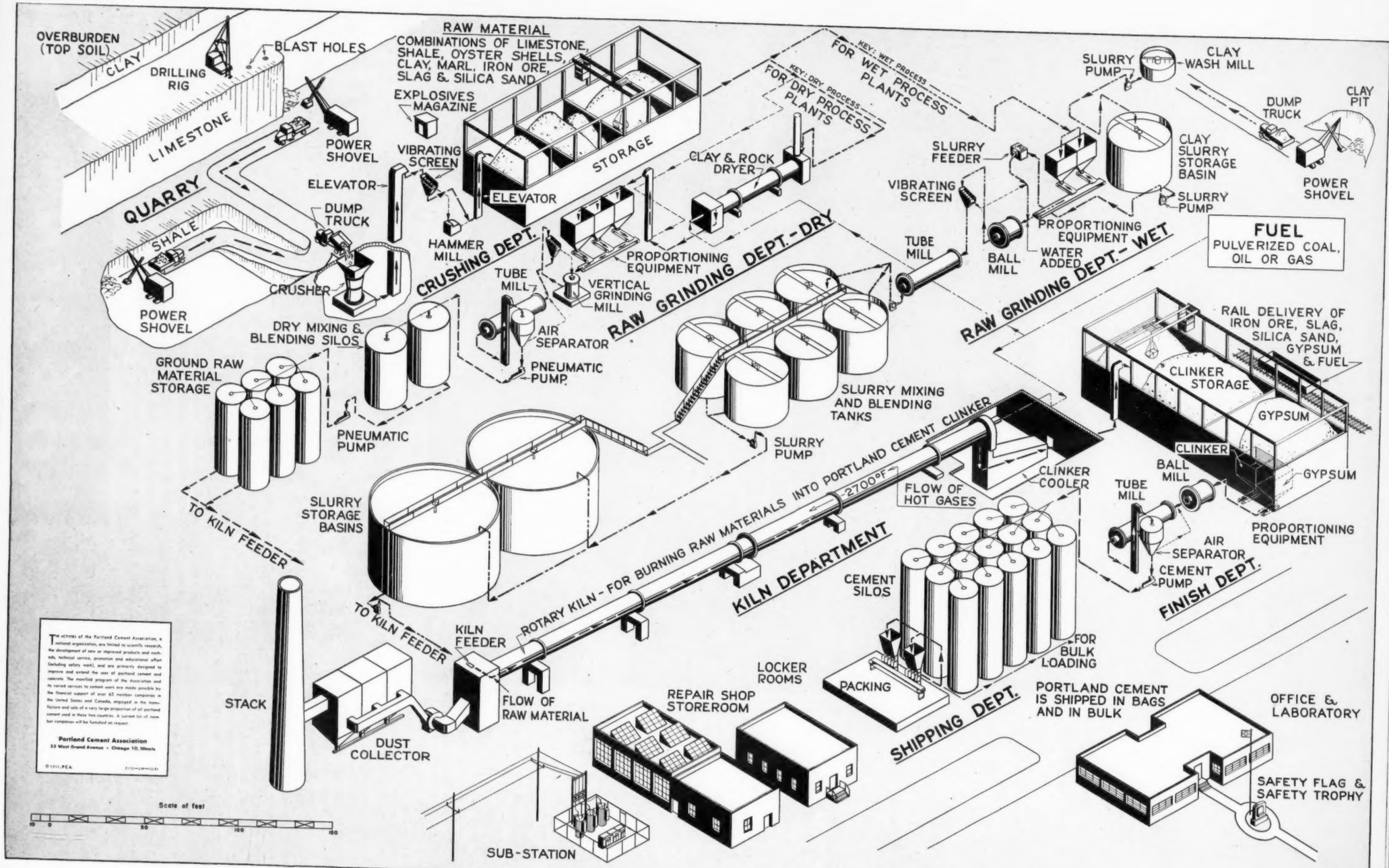
- Many Interchangeable Parts
- A One-piece Turntable Bed
- Drop-forged Hook Rollers
- 5 Interchangeable Booms
- 4 Types of 2-speed Crawlers
- Drop-forged Treads
- Independent House Lock
- 4-Rubber-tire Mountings

TL 25 THEW LORAIN
THE THEW SHOVEL CO., LORAIN, OHIO


OVERBURDEN (TOP SOIL)
CLAY
LIMESTONE
DRILLING RIG
BLAST HOLES
QUARRY
POWER SHOVEL
SHALE
CRUSHER
DUMP TRUCK
ELEVATOR
VIBRATING SCREEN
HAMMER MILL
CRUSHING DEPT.
RAW MATERIAL
COMBINATIONS OF LIMESTONE, SHALE, OYSTER SHELLS, CLAY, MARL, IRON ORE, SLAG & SILICA SAND
EXPLOSIVES MAGAZINE
STORAGE
ELEVATOR
KEY: DRY PROCESS FOR DRY PROCESS PLANTS
KEY: WET PROCESS FOR WET PROCESS PLANTS
CLAY & ROCK DRYER
PROPORTIONING EQUIPMENT
TUBE MILL
VERTICAL GRINDING MILL
AIR SEPARATOR
PNEUMATIC PUMP
RAW GRINDING DEPT.- DRY
SLURRY PUMP
CLAY WASH MILL
DUMP TRUCK
CLAY PIT
POWER SHOVEL
SLURRY FEEDER
CLAY SLURRY STORAGE BASIN
SLURRY PUMP
VIBRATING SCREEN
TUBE MILL
BALL MILL
WATER ADDED
PROPORTIONING EQUIPMENT
RAW GRINDING DEPT.- WET
FUEL
PULVERIZED COAL, OIL OR GAS
RAIL DELIVERY OF IRON ORE, SLAG, SILICA SAND, GYPSUM & FUEL
CLINKER STORAGE
GYPSUM
CLINKER
BALL MILL
GYPSUM
TUBE MILL
PROPORTIONING EQUIPMENT
AIR SEPARATOR
CEMENT PUMP
FINISH DEPT.
DRY MIXING & BLENDING SILOS
GROUND RAW MATERIAL STORAGE
PNEUMATIC PUMP
SLURRY MIXING AND BLENDING TANKS
SLURRY PUMP
TO KILN FEEDER
SLURRY STORAGE BASINS
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FLOW OF HOT GASES
CLINKER COOLER
TO KILN FEEDER
KILN FEEDER
ROTARY KILN - FOR BURNING RAW MATERIALS INTO PORTLAND CEMENT CLINKER
KILN DEPARTMENT
CEMENT SILOS
FOR BULK LOADING
PACKING
SHIPPING DEPT.
PORTLAND CEMENT IS SHIPPED IN BAGS AND IN BULK
STACK
DUST COLLECTOR
FLOW OF RAW MATERIAL
LOCKER ROOMS
REPAIR SHOP STOREROOM
SUB-STATION
OFFICE & LABORATORY
SAFETY FLAG & SAFETY TROPHY
Scale of feet
50 0 50 100 150
The activities of the Portland Cement Association, a national organization, are limited to scientific research, the development of new or improved products and methods, technical service, promotion and educational effort (including safety work), and are primarily designed to improve and extend the uses of portland cement and concrete. The manifold program of the Association and its related services to cement users are made possible by the financial support of over 65 member companies in the United States and Canada, engaged in the manufacture and sale of a very large proportion of all portland cement used in these two countries. A current list of member companies will be furnished on request.
Portland Cement Association
33 West Grand Avenue • Chicago 10, Illinois
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THE MANUFACTURE OF PORTLAND CEMENT
ISOMETRIC FLOW SHEET

How Portland Cement Is Manufactured Today

From Raw Material to Finished Product: the Modern Cement Plant and Equipment Described in Detail

By LEO DOLKART,
Consulting Engineer

• AS far back as 2000 B. C., the Babylonians built stone-paved roads from Babylon to Nineveh, as the ancient historian Strabo tells us. These roads made use of a mortar or cementing agent to hold stones together, the mortar being in some cases a volcanic ash and in others a tar-like substance. In Egypt, the building of the Pyramids required some good cementing mortar to hold the massive stones in place, as well as good roads over which to transport the huge building blocks, since they came from quarries great distances away.

As to the Romans, they were the first to realize the national importance of good commercial roads. About 312 B. C., Claudius Appius built the famous Appian Way, the queen of all roads. It originally extended from Rome to Capua, and more than two centuries later Julius Caesar extended it to Brindisi. The specifications for it are some of the earliest recorded specifications for engineering projects. The road was 16 to 32 feet in width and had a depth of about 3 feet. The foundation, or *statumin*, was formed by embedding large flat stones in a cementing mortar. Above this was the *rudus*, or hand-sized rock, laid in a cementing mortar; then a layer of *nucleus*, or small rock or gravel, laid in mortar; and finally a layer of *summa crusta*, a slab of flat stones closely joined.

The Romans were the first to make use of pozzolan, a type of volcanic ash found near the city of Pozzouli. Since this ash is very similar to our ground-cement clinker, when mixed with water it makes a product similar to our concrete. So, in a manner, the Romans were the inventors of calcined limestone and what corresponds to our portland cement. Real portland cement, though, was first made by an Englishman, Joseph Aspdin, a bricklayer of Leeds, about 1820. He burned limestone and clay in his kitchen stove and called it portland cement because it looked very much like the stone quarried in Portland, England. So, from this meager beginning at Leeds, the portland-cement industry developed into a business that produced in the United States alone, in 1947, nearly 185,000,000 barrels of cement.

Manufacturing Process

How does the modern cement plant compare with the kitchen stove of Joseph Aspdin? The following description indicates the various processes and materials involved.

Portland cement is made of three main ingredients: limestone (calcium carbonate), clay (alumina), and gypsum (hydrated calcium sulfate). Often other additives such as iron oxide, may be required, depending upon the chemical analysis of the limestone, gypsum, and clays used. The amount of gypsum required is only 1 to 3 per cent by weight. Limestone is the chief ingredient—about 60 per cent—so much of the quality of the cement depends upon the purity of the limestone that is available.

Limestone is usually found in horizontal deposits and varies as to hardness, color, weight, and composition. If it is broken down by weathering it may be mined by pick and shovel; on the other hand, if it is hard, it usually has to be broken down by blasting. In color it may be black, dark brown, or gray. Often it is found as a pure calcium carbonate and often it also contains magnesium carbonate.

There are two general processes for the manufacture of portland cement—the wet and dry process. Essentially they are the same, except that in the wet process the quarried rock or limestone is mixed with water, reduced to a slurry in tanks, and then, after the water is extracted, is burned. In the dry process the limestone is ground dry before calcining. For the sake of simplicity, therefore, the dry process is described in the following review.

The manufacturing process itself is divided into four distinct steps. The first is concerned with the strictly raw materials; the second covers proportioning and preliminary grinding into a "raw-mix" material group; the third covers blending and calcining of the materials into "clinker"; and the fourth covers the grinding of the clinker and gypsum into the finished product, or portland cement. This last step also includes storing and sacking the product, ready for use in the industry.

First Step

The quarry, from which the overburden has been removed to facilitate

(*Concluded on next page*)

THE MANUFACTURE OF PORTLAND CEMENT
ISOMETRIC FLOW SHEET

JOE BATIS CONSTRUCTION CO. Says

Bore Holes Faster—Cheaper

THAN ANY MACHINE ON THE AMERICAN MARKET WITH

THE NEW MODEL KJ-254

Jaques

Earth-Boring Machine!

"I have used Jaques Hydraulic Earth Boring Machines for approximately 7 years. I recently bought my third machine. I have found that Jaques Machines can be bought cheaper and operated for less cost than any other machine on the market today." Signed: Joe Batis, JOE BATIS CONSTRUCTION COMPANY, Abilene, Texas.

Shown above is the KJ-254 Jaques Standard Unit owned by the Joe Batis Construction Co. of Abilene, Texas. This unit bores standard 10-ft. holes, 9 to 48 inches in diameter. (Also built to go depths up to 30 ft. at additional cost.) Skid mounted with option of turn table or wiggle tail.

This machine is the result of over 29 years of research and experience in building earth augers. The Jaques Earth Auger is nationally and internationally known by hundreds of users such as telephone and utility companies, highway departments, oil companies, general contractors, R.E.A. Cooperatives, the United States Government, Canada, Australia, France and other foreign countries.

FINGER-TIP HYDRAULIC CONTROLS!

Jaques has the only Earth Auger built with Fully Finger-tip Hydraulic Controls. Our hydraulic system in and out of the hole is so designed that the operator can apply any amount of pressure in digging according to the type of soil. The model shown here sells for the low price of

$4550. f.o.b. Denison, Texas. 90-Day Guarantee

"When Better Earth Boring Machines Are Built, Jaques Will Build Them." Write:

THE JAQUES EARTH AUGER CO., BOX 298, DENISON, TEXAS

DON'T THROW THEM AWAY

Keep Your Wheel Barrow Scales • Let Us Furnish You With A

CIMCO TWIN BIN

TO MOUNT OVER THEM

The Very Latest—Most Economical Batching Plant. For Use with 1-2-3 Bag Mixers

Patent Pending

SPECIFICATIONS

UPPER—STOCK BIN

1. Weight—610 lbs.
2. Height—7 ft.
3. Width—112 in.
4. Clam or Loader Bucket width—56 in. Max.
5. Capacity—40 Cu. ft.

LOWER—SCALE BIN

1. Weight—180 lbs.
2. Capacity—8.50 cu. ft.
3. Fits scales platform 33 In. x 21 In. or larger.

SET UP QUICKLY—EASY TO MOVE—CHARGED WITH FRONT-END LOADER OR CLAM

Your Tractor Operator Does Not Watch Scales Dial
Two Compartments — Batch Materials Like Large Bins

WITH CIMCO TWIN BIN

For Complete Information On How To Use Twin Bin On Your Job, Write For Information On Distributor Territories Now Open

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For the Asking

1 Literature or further information from any C & E Monthly advertiser in this issue

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3 A reprint (while they last) of our article "Prestressed Concrete: Its Future in the U.S."

Use the request card bound in at page 16. No postage is required.

Contractors and Engineers Monthly

the NEWSpaper of highway and heavy construction

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How Portland Cement Is Manufactured Today

(Continued from preceding page)

the work of moving the limestone from both the top and face of the deposit, supplies the chief ingredient of portland cement. In most quarries the limestone is first loosened by explosives. The blasted material is then removed by a crawler shovel and loaded directly into trucks or quarry dump cars. These are conveyed to a position above the main crusher and dumped directly into it. The clay, too, is trucked or hauled and is often stored on one side of the crusher for use as required. The limestone and clays are crushed separately in the main crusher.

This crusher is the gyratory type, very massive, which reduces the original material as it comes from the quarry, often 2 and 3 feet in size, to pieces from 6 to 8 inches in size. From this crusher the material is lifted by some form of bucket elevator into a steel storage bin over a secondary crusher or hammermill. In this secondary crusher the material is further reduced to about ½ to ¾ inch in size. A screen rejects the larger pieces and these circulate back into the crusher. The gaged rock or clay is then lifted by an elevator and distributed by a conveyor to separate storage bins or silos. When required for use, it is drawn out from underneath these storage spaces by means of a conveyor. This completes the preliminary or first stage in the process.

Second Step

Before the materials can be ground any finer, they must be thoroughly dried. So by conveyor and elevator, the limestone and clay are removed from the storage bins or silos to rotating dryers 20 to 60 feet long and 5 to 6 feet in diameter. These dryers may be heated by powdered coal, oil, or gas. In the dryer the temperature is kept low enough to remove all moisture but not to calcine the material. After drying, the materials are conveyed on belts to storage silos, lifted over the silos by bucket elevators, and then distributed to them by another conveyor. (So far the clay has been kept and stored separately from the limestone.)

From here the materials are conveyed to bins over proportioners, which automatically proportion limestone and clay by weight. The materials are then conveyed to a bin over a ball mill where they are further ground and screened; and conveyed to bins over a series of raw-mix rotating tube mills. The tube mills are from 6 to 8 feet in diameter and 15 to 25 feet long. They often operate in pairs, an upper one discharging into a lower one. They are made of heavy boiler steel plate, lined with cast-steel plates, and are partially filled with grinding balls which vary in size from ¾ to 2 inches in diameter. The linings are arranged in such a manner as to cause the materials to move from inlet to outlet as they are being ground. The finely ground material as it leaves the lower mill is usually picked up by a screw conveyor and then carried over for distribution to blending silos. Since this material is finely ground, it is often more economical to convey it to the storage silos by means of air under pressure through conveyor pipes 4 or 6 inches in diameter.

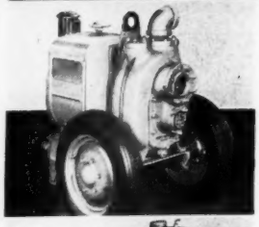
Third Step

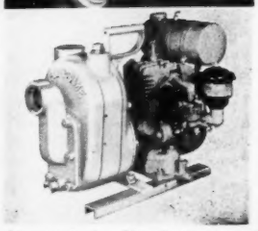
The material in the blending silos is now homogeneous, since the clay and limestone have been previously proportioned and thoroughly ground together. From these silos the materials are removed through motor-operated valves onto a conveyor, and then elevated, usually by screw conveyors, to bins feeding rotating kilns. These kilns are

PUMP DESIGN At it's Best

CMC DUAL PRIME

THE LAST WORD IN PUMP DEPENDABILITY





- Unmatched self-priming speed is assured by *exclusive* twin jet construction.
- Extra hair-handling ability gives *dependable* performance when ordinary centrifugal pumps become air bound and lose prime.
- Non-clogging, open thrash type impeller handles solids up to ¼ intake size.
- CMC DUAL-PRIME pumps give top performance and maximum dependability even under the most adverse conditions.

Write today for latest illustrated catalog. CMC DUAL PRIME pumps are available in sizes from 1½" to 10"—capacities from 3000 to 200,000 gallons per hour.

CONSTRUCTION MACHINERY COMPANIES WATERLOO, IOWA

Strike Back!

GIVE

TO CONQUER CANCER

PUT MORE ACTION IN COMPACTION with BUFFALO-SPRINGFIELD Gardner SEGMENTED ROLL

Official Tests Prove Buffalo-Springfield Gardner Roll Gives 3 to 7% Greater Compaction with Fewer Passes!

Actual tests, on projects under engineering supervision, reveal these important facts about this revolutionary new roll. When used in place of the smooth-faced guide roll on a conventional tandem, it increases compaction densities 3 to 7%, produces a better textured surface, less susceptible to traffic damage. Further—experience in compacting a variety of materials—including earth fills, stabilized bases and hot and cold mix bituminous—proves fewer passes are required to achieve specified densities.

Here's what T. F. Baun, president of Baun Construction Company, Fresno, California, says about performance of this great new roll on a recently completed California State Highway Project:

"The roll did an excellent job, both from an engineering and cost standpoint. We used it to compact the soil cement treated base, the plant mix base and the finish surface. In addition to saving the cost of other equipment, we got better compaction—in most cases with fewer passes—than if conventional type rollers had been used."

There's an Authorized Buffalo-Springfield Distributor Conveniently Located to Serve You

The Buffalo-Springfield Gardner roll is interchangeable with the smooth-faced guide roll on Buffalo-Springfield Tandem models KT-19, KT-20, KT-24B and KT-25B tandem rollers. It is also furnished for previously manufactured Buffalo-Springfield models KT-24 and VT-30.

Investigate the time-and-money saving, quality-improving advantages of the Gardner roll. See your Buffalo-Springfield distributor, or write direct.

BUFFALO THE STANDARD OF COMPARISON SPRINGFIELD SPRINGFIELD, OHIO

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF ROAD ROLLERS

usually huge affairs, from 125 to 400 feet long and from 8 to 12 feet in diameter, made of very heavy steel plate and lined with special firebricks. Owing to the great weight and length of these kilns, as well as to the fact that they are heated to high temperatures, extreme care has to be taken to keep them well supported. For this reason they have a large number of weight-supporting wearing bands or tires, rolling on single or double trunnions or roller bearings. These, in turn,, are supported by heavy concrete foundations. In order to facilitate the movement of the materials while they are being burned or calcined, the kiln is inclined, usually about ½ inch per foot. Gas, powdered coal, or oil are the usual burning media used.

Material enters at the upper end of the kiln while the fuel enters at the lower end. The maximum temperatures for calcining often reach 2,300 to 2,800 degrees F and occur in the burning zone, from one-half to one-third of the distance from the lower end. Ordinarily limestone begins to calcine at 1,700 degrees F and if kept at that temperature will finally change into quicklime and carbon dioxide gas. However, if the temperature is raised to the fusion point, about 2,300 to 2,800 degrees F, and kept there, the mass fuses and turns into clinker. As the mass of clinker moves down the incline from the burning zone, it begins to cool in spite of the fact that the fuel is entering at the lower end. Also, in order to supply sufficient oxygen from combustion, both steam and air are blown in with the fuel. To prevent cold air from entering the kilns and the hot gases (product of combustion) from leaving them except through the chimney, a special air-sealing ring and chamber is provided at the upper end of the rotating kiln. This allows the gases to escape into the stack and at the same time permits the limestone mix to enter the kiln.

The hot clinker when it leaves the kiln does so into a rotating cooler placed far enough below the lower end of the kiln to permit easy flow. The cooler is a cylindrical affair, similar to the kilns but much smaller, from 5 to 6 feet in diameter and from 15 to 20 feet in length. It is usually kept cool by a series of water sprays on its outside surface.

The material as it emerges from the cooler has now the appearance of hard, grayish pebbles, something like furnace clinker. It is deposited on conveyor belts, lifted by bucket elevators, and distributed from a conveyor onto the clinker-storage floor as space dictates.

Fourth Step

Through openings in the clinker-storage floor, which may be opened or closed from the conveyor tunnel below, the clinker next drops onto a belt conveyor, is carried to an elevator, and is deposited in steel bins over a rotary crusher or centrifugal mill. Gypsum which has been shipped in by freight and stored near the clinker-storage area, is also deposited in a separate bin over this crusher. Here each one receives its preliminary grinding and is suitably screened; all rejects are conveyed back to the crusher. Finally, the materials are carried up in an elevator, deposited into a screw conveyor, and conveyed into bins feeding the finishing mills. There are two bins for each of these mills, one for storing the partially ground clinker and the other for the partially ground gypsum. The materials from these bins drop into weighers which proportion the gypsum to the clinker as the materials enter the finishing mills. The finishing mills are also in pairs and are like the raw mills mentioned previously; they, too, are lined with heavy cast plates, are partially filled with metal-grinding balls, and do the final grinding of the clinker and gypsum mixture. The result of this grinding operation is the portland cement of commerce.

The cement, as it leaves the final lower mill, is picked up by a conveyor, usually a screw type, and then forwarded by means of compressed air to cement-storage silos and a packhouse some distance away. From the cement-storage silos the cement is conveyed to bins placed over automatic sacking machines; further screened by means of vibrating screens; and then dropped into the sacking machines. These are complicated affairs that automatically weigh the cement as it enters the sack and fill four sacks at the same time. Since the sack is filled at the bottom end, it automatically seals itself when it is up-ended. The filled sacks are automatically dropped onto a conveyor and either loaded into freight cars or trucks or else brought to the adjacent storeroom. Sometimes the cement is sold in bulk instead of being sacked. In such cases, without entering the sacking machine, it is loaded directly into cars or trucks.

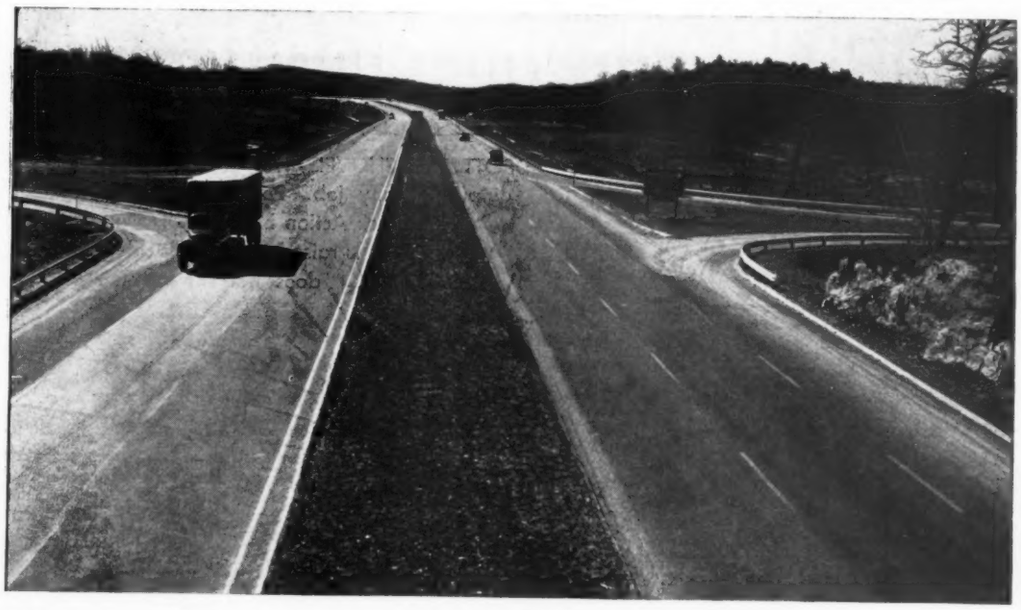
Quality of the Cement

Cement, as it comes out of the final mills, has a very fine texture and will pass a mesh having 40,000 holes per square inch. The function of the gypsum in the cement is to provide a retarder and hardener, and the more slowly the mass of concrete is allowed to set, the harder will the final mass become. The entire theory of concrete depends upon the facility with which each particle of gravel and sand becomes thoroughly coated with cement and thereby forms a homogenous mass. There are various possible combinations of cement, sand, gravel, and water to make up concrete of various strengths. The usual combination is 1 : 3 : 5—that is, one part of cement, three parts of sand, five parts of gravel, and sufficient water to soak the mixture thoroughly. For large masses of concrete, reinforcing bars are added to carry some of the load strains. Today we are beginning to make use of the principle of prestressing so that when the actual load strain comes on the concrete mass, the prestressing will tend to equal out the load and so remove the strain on the concrete. This principle has been applied to underground and above-ground concrete fuel-oil storage tanks as large as 140 feet in diameter and over 40 feet in height, and to large bridge beams.

In casting enormous masses of concrete, provision has to be made to dissipate the great heat engendered in the mixture. This is often accomplished by the use of refrigeration tubes embedded in the concrete mass itself. After hardening, these tubes act as reinforcing bars.

Since cement-making is essentially a chemical process, the quality of cement depends to a great extent on the care which has been given to the various reactions and chemical tests during manufacture. All modern cement plants maintain a corps of experienced chemists and a well equipped chemical laboratory. The chemists must keep constant tests of all raw materials as they

(Concluded on next page)



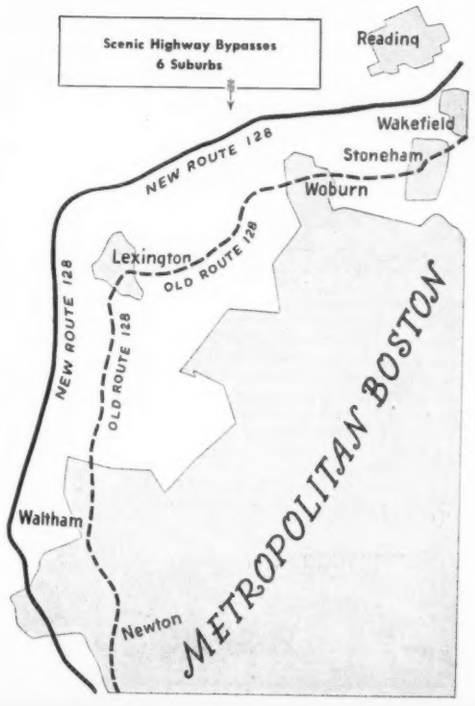
New Bypass Helps Untie Boston Area Traffic Knots

Until recently motorists trying to avoid downtown Boston's heavy traffic had to wind along old Route 128, a tortuous, 70-minute trek through six suburbs.

Using the new, 22-mile Northern Circumferential Highway, drivers can now rim the Hub in 30 minutes. More than a million cars a month travel this limited-access road, termed "the most needed expressway in all New England." The highway connects the Worcester Turnpike with the Newburyport Pike, and it will be part of an expressway from the Connecticut border to the New Hampshire line.

Flanked by paved shoulders, the two 24-foot roadways have a grassy median strip 20 feet wide. Another safety measure is the design, which permits a free flow of traffic on and off the highway. Forty-five bridges eliminate intersections and traffic lights. The State of Massachusetts maintains two patrol trucks to service automobiles in trouble.

Seven contractors completed the $18 million job. Bethlehem furnished structural steel, reinforcing steel, bar mats, dowel units and guard rails.



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BETHLEHEM STEEL

How Portland Cement Is Manufactured Today

(*Continued from preceding page*)

are delivered during the day. If any variations or deficiencies exist, these must be corrected for each batch of raw materials. Several times a day samples are taken—samples of the dried materials, of the raw mixes, of the clinker, of the gypsum-and-clinker mixture as it enters the final grinding mills, and of the finished cement as it leaves the last mill. The finished cement is then put through the various tensile and compression tests suggested by the Portland Cement Association and the Strength of Materials Standards. The chemist also has to watch the calcining of the clinker in the kilns. Obviously all corrective steps must be taken before the finished product is made and not after the entire process is complete. The chemist is the one person who determines the exact proportions of all the materials to be mixed as well as the amount of gypsum to be used for each type of clinker. This is particularly true of those cements that are specially made up to meet certain specifications as to content, hardness, quick setting, etc.

Power and Equipment

Since a cement plant is on a 24-hour-a-day operating basis, its motive power must be of such a nature as to insure constant operation. In this country electrical power failures are very few. In foreign countries such is not the case, and there it is customary to provide standby power sources. This is particularly essential in the case of the kilns. Since these units are rather long and subjected to very high temperatures, stoppage of rotation while the kiln is hot may cause very dangerous warping, not to mention loss of firebrick linings and loss of materials in the process of burning. Replacing firebrick in a kiln is an expensive and time-consuming task. In this type of plant operation, great care must be exercised in the selection of most of the equipment, for the continuity of operation depends upon the weakest machine. It bears out the truism, "The chain is as strong as the weakest link." Consequently cement plants are usually equipped with diesel-operated standby generators large enough to provide emergency power for operation of kilns, boilers, and pumps.

Sales Engr. for Steel Co.

A. C. Erlandson has been appointed Territorial Sales Engineer for Kensington Steel Co., Chicago, Ill., a subsidiary of Poor & Co., Chicago, and manufacturer of renewable-tip hammers and grate sections for pulverizing equipment. Mr. Erlandson's territory includes lower Michigan, northern Illinois, and southern Wisconsin. His office will be at company headquarters—505 Kensington Ave., Chicago 28.

A Dual-Purpose Oil

The internal-combustion engine which is temporarily taken out of service for storage or shipment presents a special problem. It must be properly lubricated for service preceding or following the stand-by period, and it must be protected against rust and the acidic products of combustion while it is not being used. Usually the lubricant has been drained from the engine and a preservative put in, or vice versa—depending, of course, upon whether the engine was going in or out of service. But a new dual-purpose lubricant has recently been developed by the Port Neches, Texas, Laboratories of The Texas Company, 135 E. 42nd St., New York, N. Y.

Preservative Oil 10 and 30 has been used in several tests. One test required that steel panels which had been dipped in the oil should remain free of corrosion after 200 hours' exposure in a humidity cabinet at 100 degrees F and 95-100 per cent relative humidity. The company points out that the new oil gave protection for more than 1,000 hours.

In addition to its application in the engines of vehicles scheduled for storage or shipment, the new lubricant-preservative has proved useful in stationary engines, reports the company. When functioning as a lubricant, the oil need not be changed until the engine has reached a normal drain-and-refill point. It is compatible with qualified heavy-duty motor oils.

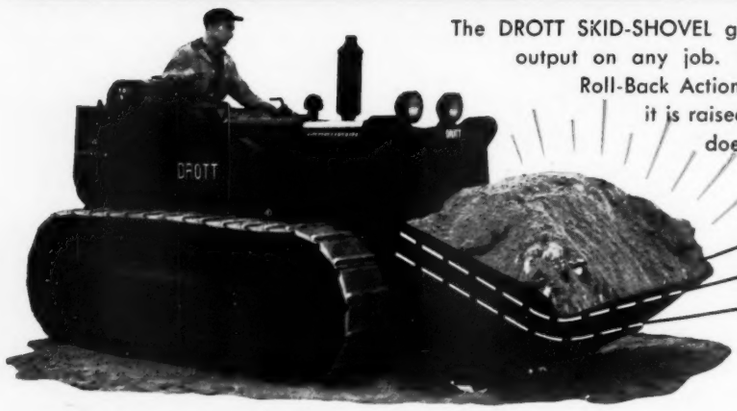
Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 632.

New Manitowoc Corporations

The Manitowoc Shipbuilding Co., Manitowoc, Wis., has announced that its three principal product lines will be manufactured and distributed by three separate corporations, instead of divisions of the parent company. These new corporations will have their own boards of directors and officers, and will act as independent units.

The manufacture and distribution of power shovels, cranes, draglines, and other equipment will be carried on through the Manitowoc Engineering Corp., with J. D. West as its President. Manitowoc Shipbuilding, Inc., will handle the shipbuilding activities and Manitowoc Co., Inc., the refrigeration.

which line do you operate on?



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Look for this Mark of STERLING Quality

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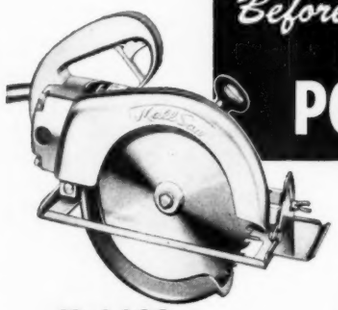

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Bituminous Macadam On Sand-Gravel Base

Maine Paves 3.15 Miles of U. S. 302; Relocates Section; Widens Causeway Across Pond With Stone Fill

• ONE of the major road projects completed this year in Maine is the 3.15-mile improvement on U. S. 302 in the Town of Bridgton, Cumberland County. Beginning on the westerly side of Moose Pond, the reconstruction crosses the water on a causeway ½ mile long, and extends easterly in the direction of Bridgton. Work on the Federal-Aid job got under way in August, 1951, after the Maine State Highway Commission awarded a contract to Frank Rossi of Gardiner, Maine, on a low bid of $335,-127, and the job was scheduled to be finished this summer.

The existing blacktop road, 18 to 20 feet wide, was showing signs of wear, and one stretch was marked by curves and sharp grades. A relocation section, 3,000 feet long, eliminated the bad curves together with the steep dips and rises. Over the rest of the improvement the old and new alignments nearly coincide. The original pavement was laid in 1922.

Across the causeway the roadway was narrow, with only 2-foot shoulders flanking the pavement. A wooden guardrail along the top of the slope on each side required constant maintenance. This strip was widened with stone fill dumped into the pond on both sides, and the finished cross section conformed to the design of the rest of the road.

Modern Highway

The new bituminous-macadam pavement is 24 feet wide, has a 3½-inch center crown, and is bordered by 8-foot shoulders pitched at the rate of ¾ inch to the foot. Fill slopes are 4 to 1, while the cut slopes in earth vary from 2 to 1 to 3 to 1 and in ledge rock ¼ to 1. On the Moose Pond causeway the stone fill is on a slope of 1¾ to 1, with the top of slope placed 3 feet beyond the outer edge of the shoulders.

The macadam pavement is 3 inches thick, and is laid on a 1-inch sand-and-gravel leveling course. Beneath the latter is a 9-inch gravel base, and under the gravel is a 9-inch sand base. Both the gravel and sand layers extend out under the shoulders to the slope lines. The shoulders consist of a 4-inch gravel lift laid over the gravel base, and the inner 2 feet of shoulder adjoining the pavement was given a bituminous surface treatment.

Grading

Earth excavation, according to the estimate, amounted to 55,000 yards, while rock excavation totaled 7,500 yards. Neither item was sufficiently large to fill in the roadway, so a borrow pit for dirt was opened up approximately one mile from the east end of the job. For the stone fill at the causeway some 22,000 yards were needed, and to make up the difference between that amount and the rock taken from the highway, the contractor had to take the material from a quarry located outside the right-of-way. Each piece in the stone fill had to weigh at least 10 pounds, and 40 per cent of the stone had to be over 80 pounds in weight.

Rock equipment included three Chicago Pneumatic wagon drills, each powered by a 315-cfm air compressor —two C-P's and one Worthington. Excavation was handled by three 1½-yard shovels—two Northwests and one Thew-Lorain — while trenches for drainage pipe were dug with a Northwest ¾-yard backhoe. Rock and dirt on the long hauls, was moved by a fleet of 12 Mack trucks averaging 6 yards a load. For the shorter dirt hauls there were two LeTourneau 12-yard Carryalls pulled by Caterpillar D8 tractors.

Dozer work was done with another D8 together with a D6 and a D4, and the final shaping of the grade was carried out by a Caterpillar motor grader. For the first two months of the contract—August and September—grading was concentrated mostly in a big cut on the new location in order not to interfere with the heavy summer traffic over the existing road. As the traffic flow dropped off in the autumn, the rest of the job was opened up and brought to grade. Stone fill for the causeway was placed during the winter. A layer of dirt went on over the top of the causeway, filling in the interstices of the rock, and providing a

(Concluded on next page)

C. & E. M. Photo

Two Caterpillar D8 tractors pulling LeTourneau Carryalls load a cut section of U. S. 302, near Bridgton, Maine. Frank Rossi of Gardiner, Maine, was the contractor on the $335,127 reconstruction project.

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SUNBURY, PENNSYLVANIA

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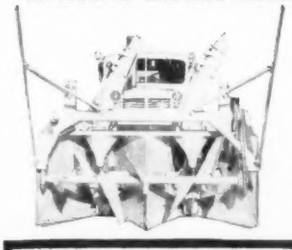
The Sno-Flyr's rotating feeding rake chops vertically at hard-packed banks, shattering the snow and delivering it back into two dual-sided rotor discs which whip it straight up and out the casting chutes.

Bros "single direction" snow travel design is the shortest and most effective method of handling. In light, fluffy snow the Sno-Flyr can plow at speeds up to 25 m.p.h.

Plow moldboard is 9' wide, has two snow wells. Special gathering wings on sides increase plowing width to 14'. Exclusive optional loading chutes fill trucks on either side faster with "swing loading" delivery. All Sno-Flyr controls are hydraulic, grouped in a convenient cab control bank.

Greatest new Sno-Flyr features are the "finger-joint" chute cappers described below.

EXCLUSIVE CASTING CHUTES—TURN 345°, CAST ANYWHERE



You've never seen anything like it! By separate hydraulic cab controls, the operator can aim the chutes in any direction, individually or together. And for the greatest possible positive control, he can adjust height of snow stream arc in a split second with the exclusive Bros segmented capping devices . . . just like crooking your finger! He can spot-cast up to 150' away, casting high with favorable winds or casting low in.o the wind. He can cast up over banks or cuts. No other rotary offers snow stream control like this!

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SNO-FLYR models also available for graders and crawler tractors, as well as units for railroad and high altitude work.

Bituminous Macadam On Sand-Gravel Base

(*Continued from preceding page*)

foundation for the base courses.

Base and Pavement

All sand and gravel came from pits not over 3 miles from the job. For the bottom course the sand specifications required that not more than 6 per cent of the material pass the No. 100 sieve, and that not more than 45 per cent pass the No. 40 sieve. As for the gravel, the material was graded from 3 inches down, with not more than 70 per cent passing the ¼-inch sieve. For the 1-inch leveling course all the sand and gravel material passed the ¾-inch sieve. Gravel for the leveling course and the shoulders was crushed on the job by an Austin-Western No. 201 portable crushing plant driven by an International UD-18 diesel engine.

Stone for the 3-inch layer of bituminous-macadam pavement was hauled from the Bluerock Quarry 40 miles away. Gradation for the three sizes of stone used in the paving was as follows:

C. & E. M. Photo

This Austin-Western No. 201 crushing plant processed material for the Maine road improvement. In the background is the causeway across Moose Pond.

Sieve Size	Per Cent Passing		
	Coarse Stone	Key Stone	Chips
2½-inch	100	.....	.....
2-inch	95–100	.....	.....
1-inch	.....	100	.....
¾-inch	0–15	90–100	100
½-inch	.....	20–55	95–100
⅜-inch	.....	0–15	.....
No. 4	.....	.....	0–15

The key stone was applied after each of two penetrations of emulsified asphalt to fill in the voids in the layer of coarse stone, while the chips were applied to each of two seal coats over the macadam.

After the base courses were spread and compacted, both by the heavy equipment and by pneumatic rollers, 0.5 gallon of bituminous material was applied. Then the macadam stone was laid, keyed, and penetrated with emulsified asphalt put on in two applications of 0.75 gallon and 1.25 gallons to the square yard respectively. Bitumen temperatures of between 80 and 140 degrees F were required. The pavement was then finished off with the double seal coat.

Quantities and Personnel

Major items in the 3.15-mile reconstruction contract included the following:

Clearing	14 acres
Earth excavation	55,000 cu. yds.
Rock excavation	7,500 cu. yds.
Muck excavation	3,500 cu. yds.
Stone fill	22,000 cu. yds.
Common borrow	49,000 cu. yds.
Sand base course	23,000 cu. yds.
Gravel base course	19,500 cu. yds.
Surface-treated gravel course	1,400 cu. yds.
Bituminous material	33,000 gals.
Bituminous-macadam surface course	6,900 tons
Emulsified asphalt	120,000 gals.
Corrugated-metal pipe, 15 to 72-inch	2,040 lin. ft.

Frank Rossi employed an average force of 50 on the project, with F. N. Rossi as Superintendent.

For the Maine State Highway Commission, Albert F. Benson was Resident Engineer. The Commission is headed by Lucius D. Barrow, Chief Engineer, with Ernest L. Merrill as Principal Highway Engineer.

New Maintenance Booklet Covers Wheel-Type Tractors

Adding to its series of handy and informative cartoon booklets, Caterpillar Tractor Co., Peoria 8, Ill., has just released a new "Maintenance Guide" with 80 illustrations on the proper care of wheel-type tractors.

The information is presented in story form. A Cat dealer visits a construction job and conducts a class in machinery care. His talk begins with the steering and progresses through brakes, tires, wheels, clutch, lubrication, cooling, air, fuel, and cold-weather operation.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 612.

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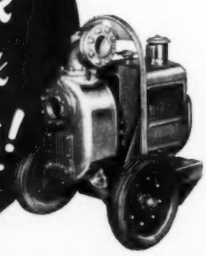

There's no need to accept conventional, low rated pumps when you can get an Essick A.G.C. rated, heavy duty Auto-Prime centrifugal! These ruggedly constructed self primers are perfect for all dewatering applications—and are especially profitable to contractors in the building trades. They prime quickly—*reprime automatically*—force a tremendous volume of water through the line.

Essick Auto-Prime Pumps are GUARANTEED to pump more water against a higher head in less time—*yet they cost no more than ordinary units—often less!*

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Gives you low cost
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Spraying of asphalt tar, emulsion, road oil and cutback can now be done with 100% efficiency by using a "Spray Master" Distributor. This modern unit gives accurate application under all conditions. "Spray Master" has fewer controls, no gadgets to operate, eliminates excessive labor. Equipped with a Vacuum Flow Full Circulating Spray Bar up to 24' makes the "Spray Master" the master of all black-top construction and maintenance jobs. Made in sizes from 800 to 4000 gallons. Make your spraying jobs low cost by using the unit designed to save time and money. Ask for Bulletin 14.

LITTLEFORD

LITTLEFORD BROS., INC.

485 E. Pearl St., Cincinnati 2, Ohio

New Diesel Models

Features of the new GMC truck models with two-speed axles are the electric shift and a new 4900 Series Synchromesh transmission. The new six-wheel diesel models consist of the DW450-37, which has ratings of 26,000 pounds GVW and 38,000 pounds GCW. The standard transmission is 5-speed overdrive, while front and rear axles are 6,000 and 15,000-pound capacity, respectively. Four wheelbases are offered, making available C. A. dimensions of 72, 84, 102, and 120 inches. Brakes are the new air-actuated hydraulic type. The engine is the GM 3-cylinder diesel developing 110 hp and 282 pounds foot torque.

The DW620-47 is a new lightweight tandem-axle diesel with GM's 4-cylinder 150-hp engine, and ratings of 33,000 pounds GVW and 55,000 pounds GCW. Air brakes and cast-spoke wheels are standard.

Model DW630-47 succeeds the former HDCW-750, with ratings of 42,000 and 70,000 pounds GVW and GCW, respectively. Capacity of the front axle is 11,000 pounds, while the SW-3010 worm-drive tandem is standard at the rear. The 6231A and 8031C auxiliary transmissions are available for highway and off-highway operations, respectively. Chassis weight reductions are about 600 pounds.

The other new GMC diesel, Model D470-37, has ratings of 21,000 pounds GVW and 45,000 pounds GCW. Chassis weight is said to be 1,400 pounds lighter than any diesel model previously offered in this capacity range. The truck is powered by the new 3-cylinder diesel.

The D630-47, formerly known as the HDCR-650, has the new 114-inch bumper-to-rear-of-cab dimension, electric axle shift control, cast-spoke integral-type wheels, lightweight load-cushion springs, and direct-acting front shock absorbers. Its GVW rating has been raised from 24,000 to 28,000 pounds.

Further information may be secured from GMC Truck & Coach Division, General Motors Corp., 600 South Boulevard, E., Pontiac 11, Mich. Or use the Request Card at page 16. Circle No. 586.

Panelcrete Firm Is Formed

Wm. P. Neil Co., Ltd., and Buttress & McClellan, Inc., two southwest construction firms, have joined to form National Panelcrete, Inc., with Rear Admiral William T. Rassieur as its President. The purpose of the new organization is to make available to the building contracting industry its successful techniques of precast tilt-up construction and to license their use on a nation-wide scale.

The counsel and services available through Panelcrete include: design standards, management counsel, technical data, methods and cost information, job-site developments, materials research, safety measures, and patented practices. Complete details of the services and licensee plan, and a fully illustrated 24-page brochure describing this method of construction, may be obtained without charge by writing to National Panelcrete, Inc., 1900 Beverly Blvd., Los Angeles 4, Calif.

A new GMC diesel-powered truck is the lightweight-tandem-axle Model DW620-47. The six-wheeler is rated at 33,000 pounds GVW and 55,000 pounds GCW. Four wheel-bases are offered.

Data on Leaf Collector

Literature on a leaf collector is available from Good Roads Machinery Co., Minerva, Ohio. It illustrates how the unit reaches into inaccessible places with its flexible snout, stores the leaves, and then dumps in a clean flow.

The leaf collector is mounted on dual wheels and is powered by a Ford 120 engine. One man pulls the unit from a truck or tractor while another moves the snout with the adjustable handlebar assembly.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 602.

Manager for Olin Division

John J. O'Neill, Jr., is the new Manager of the Research and Development Department of the Explosives Division of Olin Industries, Inc., East Alton, Ill.

WON'T QUIT
or cause time out

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company
32-36 Dey Street
New York, N.Y.

Hayward Buckets

Engineered by Dorsey
for extra-heavy loads

Hauling unusually-heavy equipment on the Savannah River Atomic Energy Commission job is the assignment of this special Dorsey trailer. Its rated capacity is 75 tons. The DuPont Company, prime contractor, also uses 100-ton Dorsey equipment.

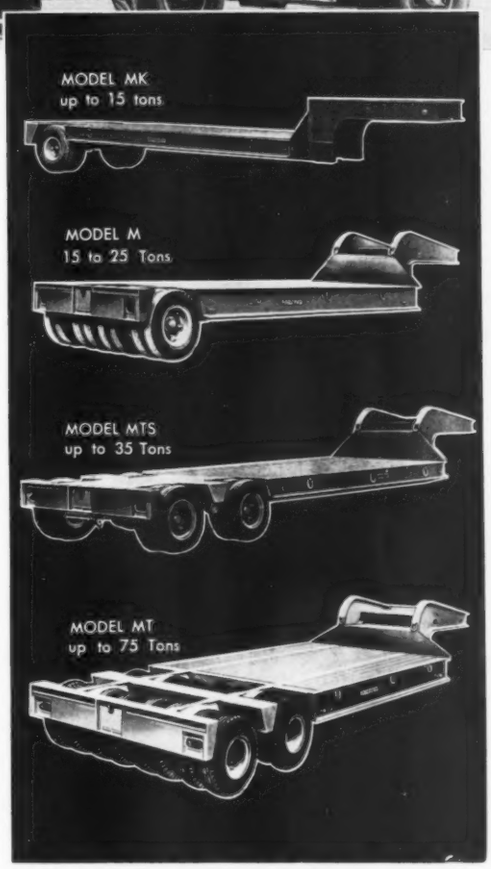
DORSEY TRAILERS

For special sizes and designs, as well as for a complete line of standard model low-bed trailers, you will find Dorsey means Dependability in heavy hauling. Carrying capacity ratings are purposely conservative.

Beam strength, tire capacity, structural members are engineered to provide a margin of safety under unusual strain. This reserve strength means safety in hauling, plus extra-long service for your trailer equipment.

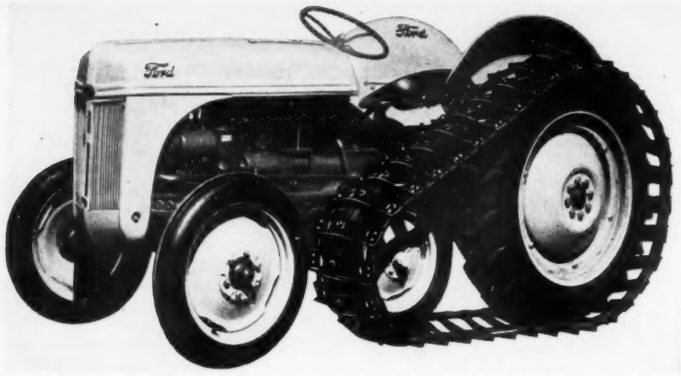
Let your Dorsey Distributor solve your heavy-hauling problems — Dorsey engineers are at your service.

For the name of your nearest Dorsey Distributor, call or wire collect —



There is a Dorsey Low Bed for every purpose: semi and full trailers in either level or drop deck models. MT available in 100-ton capacity on special order.

DURABLE DEPENDABLE DORSEY TRAILERS
ELBA, ALABAMA



Blackhawk rubber-belted half-tracks provide traction in abrasive sandy soils and fit all leading tractor-tire treads. The complete unit weighs 575 pounds.

Rubber-Belted Track For Abrasive Soils

Rubber-belted half-tracks for providing traction in abrasive sandy soils are announced by Arps Corp., New Holstein, Wis. The rubber units are a new addition to the company's line of all-steel tracks for non-abrasive operations.

Blackhawk track shoes have single and double-pressed lugs spaced to drive from all leading tractor-tire brands. The idler wheels use 5.00 x 15 pneumatic 4-ply implement rib tires and Timken tapered roller bearings.

The rubber-belted linkage is a combination fabric and 6-ply belting of high tensile strength. The steel linkage is made of case-hardened links and straps. The company points out that the half-tracks provide traction, flotation, and stability in mud, ice, snow, and soft ground.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 637.

How to Store Rock Salt

A pamphlet which illustrates and describes 10 different methods of storing rock salt has been prepared by International Salt Co., Inc., Scranton 2, Pa. It points out the advantages of ordering early and keeping a reserve supply on hand during the winter-weather months.

One storage method is to pile rock salt on the ground in the open. The company's experience has shown that almost no salt is lost in dissolution during wet weather. Another storage method is an outdoor pile stacked against the side of a building and covered with a tarpaulin fastened to the building wall at the top and held down with rocks at the bottom. In addition to open storage, either covered with a tarpaulin or not, various other methods have been developed to meet special local conditions.

The pamphlet outlines these methods and includes engineering data pertaining to the weight and volume of coarse rock salt as a help in estimating the storage space needed.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 626.

Electric Engine-Hour Meter

A bulletin on an electric self-starting engine-hour meter is available from John W. Hobbs Corp., 226 Yale Blvd., Springfield, Ill. The meter requires direct current and winds every 2½ minutes. It can be activated through an ignition or an oil pressure switch.

The standard and flush-mounting meters are produced in 10,000 and 1,000-hour types. The hours of operation are indicated by three hands. The company points out that the meter will not interfere with radio reception.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 604.

Harnischfeger Appointments

B. Pratte has been promoted to the post of General Sales Manager of the Harnischfeger Corp., Milwaukee, Wis., manufacturer of buckets, cranes, hoists, shovels, etc. He will direct domestic sales of all the company divisions except welding products, and will be in charge of all domestic branch-office operations excluding the Pacific Division, whose activities he will help coordinate with over-all sales and service policy. Mr. Pratte will also assume jurisdiction over Milwaukee repair sales and service departments. He has been with P & H nearly 20 years.

Al Hoehler, former Manager of the company's Boston office, succeeds Mr. Pratte as District Manager of the Pittsburgh office. He has been with the company since 1929. Irving Shapiro, former Manager of the Hartford office, will assume Mr. Hoehler's post in Boston.

Proven Dependability

1852 1952

VULCAN IRON WORKS CHICAGO·U·S·A

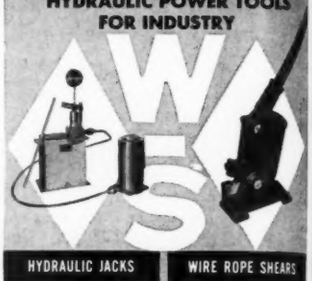
for 100 Years

Manufacturers of Pile Driving Hammers and Pile Extractors

VULCAN IRON WORKS • 329 NORTH BELL AVENUE • CHICAGO 12, ILL.

WATSON-STILLMAN

HYDRAULIC POWER TOOLS FOR INDUSTRY



HYDRAULIC JACKS | WIRE ROPE SHEARS

These sturdy units, with either independent or integral pumps, are useful for many jobs in construction and maintenance. Capacities from 20 to 500 tons.

W-S wire, cable and bar shears provide years of trouble-free general service. They are light and portable for convenient on-the-job use.

PORTABLE PIPE BENDERS | HAND PUMPS

Bends all standard, extra heavy and double extra heavy steel pipe from ⅜ in. to 2 in. inclusive, as well as standard weight pipe up to 3 in. diameter. Also handles solid mild steel bars up to 2 in. diameter.

Single and double plunger types, with reservoirs of different capacities to suit the job, these hand pumps have a wide application for operating small hydraulic tools, jacks and other hydraulic equipment, and for general hydrostatic testing purposes.

Send for your copy of Bulletin A-5 It's Free.

DISTRIBUTOR PRODUCTS DIVISION

WATSON-STILLMAN

ROSELLE, NEW JERSEY

CHINOOK WIND

QUICK, CLEAN, SAFE PORTABLE HEAT

Maximum capacity 500,000 BTUs

The solution to heating problems of winter time construction. Chinook is being hailed as revolutionary for crop drying, floor laying, thawing, aircraft warm-up, etc. In fact wherever instant, SAFE, on-the-spot, controlled heat is needed...CHINOOK WIND is providing it...CHEAPER.

Utility Model, $198.50 F.O.B. Denver—Fully Guaranteed.

For full details about Chinook Heaters and Torches write

INTERNATIONAL MANUFACTURING CO.

2249 South Delaware Street Denver, Colorado

Little Chinook Wind

The "largest tire in the world", made by Firestone Tire & Rubber Co., mounted on a 35-ton-capacity Tournapull for testing in soft swampy terrain.

Largest Swamp Tire

R. G. LeTourneau, Inc., Peoria, Ill., wanted to increase the load-carrying capacity of a "swamp buggy" undergoing development at its plant at Longview, Texas. The company sought a tire that could carry a big load over soft, swampy terrain. The special "48 x 68" was the result.

Manufactured by Firestone Tire & Rubber Co., Akron, Ohio, the giant tubeless tire, weighing 1,482 pounds, can carry a tire load of 17,500 pounds at 20 mph and is designed to operate at air pressure from 10 to 15 pounds.

To accommodate the tire, LeTourneau developed an improved low-flange wedge-type wheel which permits the operation of the tire at low air pressure, allows a maximum of sidewall flexing without incurring sidewall damage, and at the same time makes possible the changing of tires under field conditions which may include insufficient tools and poor working conditions.

The tire, said to be the world's largest (10 feet tall, 4 feet wide), is a far cry from the 13.50 x 20 tires (80-pound pressure) that the company persuaded a contractor to initiate on a scraper 20 years ago.

Data on Water-Repellent

A 4-page booklet on Silaseal, a silicone-type transparent water-repellent, is announced by Surface Protection Co., 6799 Euclid Ave., Cleveland 12, Ohio. It describes the applications of this silicone development—how porous exterior masonry surfaces can be treated with it so that they are completely water-repellent.

A section is devoted to the control and elimination of effluorescence, a common unsightly condition affecting many masonry structures.

This literature may be obtained from the company, or by using the Request Card at page 16. Circle No. 590.

GMC Truck Division Promotes

The top GMC truck sales position, that of General Sales Manager, will be held by Richard C. Woodhouse, former Assistant General Truck Sales Manager for the GMC Truck and Coach Division, Pontiac, Mich. Mr. Woodhouse, who has been with the Division since 1930, succeeds J. E. Johnson who will handle special assignments for the General Manager.

Julian M. Gilroy, former Chicago Zone Manager for the Division, is now Western Regional Manager.

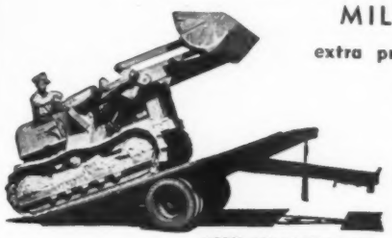
New Bulletins and Directory

Five new technical bulletins have been published by the American Road Builders' Association, Washington, D. C. They include: "Experimental Use of Lime for Treatment of Highway Base Courses"; "The Value of Welded Wire Fabric in Concrete Slabs"; "Looking Ahead With Soil-Cement in Louisiana" and "Reconstruction of Lubbock, Texas, Airport With Soil-Cement"; "Developments in Iowa's Secondary Road Soil Stabilization"; and "Lime Stabilization in District 14, Texas Highway Dept." Published primarily as a service to members, the bulletins are also available to nonmembers at a nominal cost.

The 1952 edition of ARBA's "Directory of Highway Officials and Engineers" is now available. The book lists administrative engineers and officials of the state highway departments, the District of Columbia, and the Bureau of Public Roads. It also contains a tabulation by states showing highway mileages constructed and monies expended during the past year, as well as an estimate of expenditures and mileages to be constructed during the current year. The pocket-sized directory may be obtained by writing to the American Road Builders' Association, International Building, Washington 4, D. C. It is priced at $1.00 per copy.

"the SHORTEST TIME" between jobs

MILLER Tilt-Top . . . gets extra production from slow machines!

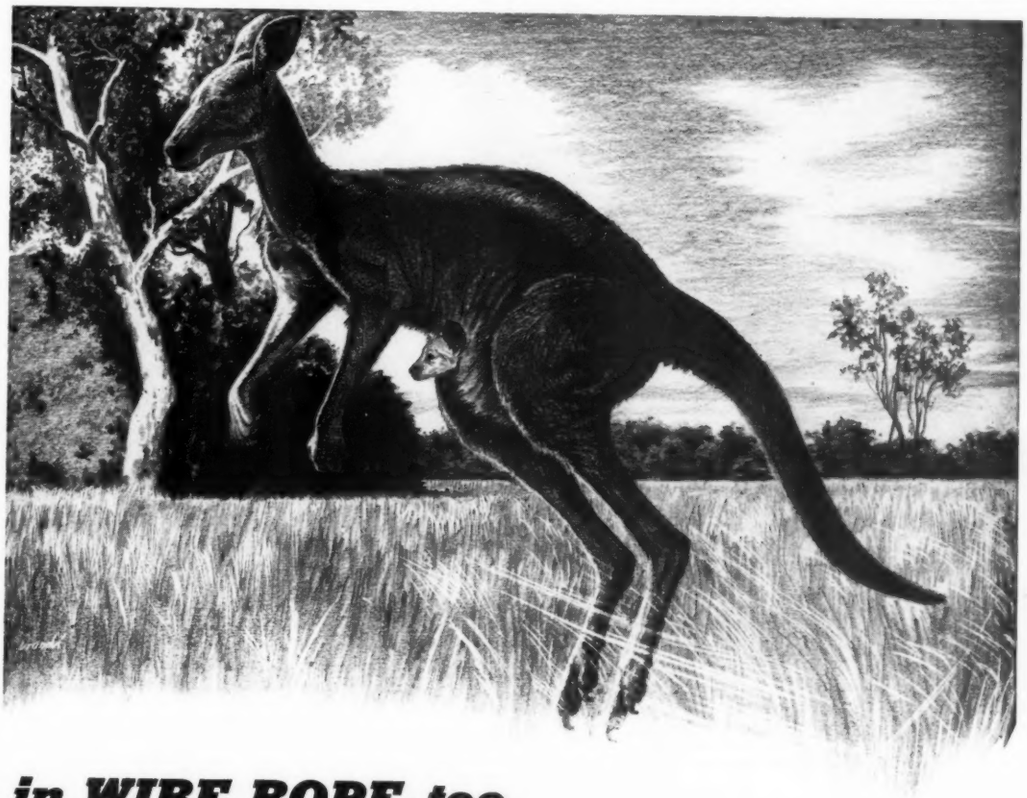


MODEL "B" 10 TON $1175. The following equipment is optional and extra: hydraulic tilt control, two speed winch, electric brakes.

Where large flat bed trailers are usually too cumbersome for lighter hauling . . . a MILLER Tilt-Top is always handy for moving slow machines from one operation to another. Self-moving equipment practically loads itself onto tilted platform and can be towed to the next operation in jig time . . . cutting non-productive time for operator and equipment to a minimum. Standard platform is 14' x 8'; optional 16' available.

IMMEDIATE DELIVERY
SEE YOUR DEALER or WRITE
Dept. C-9 456 SOUTH 92nd ST., MILWAUKEE 14, WISC.

MILLER Tilt-Top TRAILERS research engineers



in WIRE ROPE, too
the RIGHT KIND of muscle
makes the difference

Endowed with highly specialized leg muscles, the kangaroo is able to make tremendous flying leaps—even with Junior perched in the rumble seat.

In wire rope, too, specialized jobs call for specialized muscles. That's why in Wickwire Rope we make sure you always get the proper combination of physical properties to best resist the destructive forces found on your particular job—whether it be abrasion, load strain, shock stress or bending fatigue.

Wickwire Rope gives you the benefit of long experience and specialized know-how which assures you of exactly the right kind of rope your particular job demands.

For additional information write or phone our nearest sales office.

THE COLORADO FUEL & IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

WICKWIRE ROPE
CF&I A PRODUCT

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

WICKWIRE ROPE
CF&I
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL & IRON CORPORATION

Allis-Chalmers Acquisitions

Arrangements have been made between Allis-Chalmers Mfg. Co. and La Plant-Choate Co., Inc., Cedar Rapids, Iowa, for the acquisition of the latter firm by A-C. Purchase of the LaPlant-Choate plant and assets augments the Allis-Chalmers line of crawler tractors and motor graders by five sizes of earth-moving equipment. If approved by LaPlant-Choate stockholders, the Cedar Rapids plant, which will maintain the present organization, will be the eleventh A-C plant in the United States.

LaPlant-Choate was founded in 1911 when Roy E. Choate, a young engineer, formed a partnership with his uncle, E. W. LaPlant, to manufacture house-moving equipment and horse-drawn stump pullers. The company quickly expanded to earth-moving machinery and became one of the pioneers in the development of heavy trailers, steel-dump wagons, bulldozers, etc.

Allis-Chalmers also recently acquired the plant and remaining assets of Victor Electric Products, Inc., Cincinnati, Ohio, manufacturer of small motors. The plant will become part of A-C's Norwood works and will house sales, engineering, and manufacturing facilities of the company's Texrope Drive Section.

Allis-Chalmers is now in its 104th year.

New Hydraulic Crane With Telescopic Boom

A fully hydraulic truck crane that can lift and swing loads between 1,000 and 2,000 pounds has been introduced by Stedt Hydraulic Crane Co., 15 Boylston Place, Brookline 46, Mass. The Hiab's telescopic boom is adjustable from 3 feet 10 inches to 11 feet 8 inches. It can be changed to operate either in front of or behind the cab.

The truck supplies the power through a single-speed power takeoff. One man can load or unload his own or other trucks, controlling the operation from either side of the cab.

The unit requires from 10 to 14 inches of space between the cab and the body. Its maximum height above the frame is 71½ inches and the maximum lifting and swinging height is about 22 feet.

Further information may be secured from the company. Or use the Request Card at page 16. Circle No. 583.

The Hiab hydraulic truck crane can lift and swing loads between 1,000 and 2,000 pounds; an adjustable telescopic boom operates in front of or behind the cab.

Road-Building Method Reclaims Existing Material

A road-building method that reclaims the existing material in worn-out bituminous and gravel roads, eliminates hauling, and reduces the size of tough aggregate is announced in a new booklet released by Athey Products Corp., 5631 W. 65th St., Chicago 38, Ill.

The method requires seven steps. The pavement is first ripped up with a scarifier so that no pieces are over 8 inches. This loose material is windrowed to contain from 1½ to 3 cubic feet per linear foot, depending upon the material. The third step reduces the blacktop to aggregate size. A Force-Feed loader picks up the material and conveys it to the breaker where it is reduced in size and laid back on the road in windrows. The portable breaker is pulled behind the loader. It is a special twin-hammer impact type equipped with reversible and replaceable hammers.

The subgrade is then repaired, the processed windrows flattened, and the road shot with new bitumen. The oiled material is bladed and mixed by motor grader and the surface finished by rollers. A seal coat may be applied to insure a water-tight pavement.

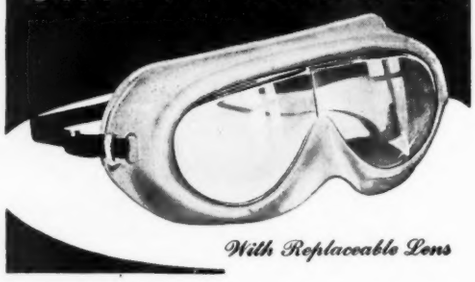
The booklet also lists complete materials, labor, and equipment costs for various road types. General information on bituminous materials, methods of laying blacktop, classes and characteristics of gravel, crushed stone, and rock is also included.

"The Athey Method of Reclaiming Worn Out Roads" is available to any person engaged in road building. Contact the company or use the Request Card that is bound in at page 16. Circle No. 611.

Col. Milwit Takes Command

Colonel Herbert Milwit has assumed command of the Engineer Research and Development Laboratories at Fort Belvoir, Va. Highlights of a varied career were his service as Deputy and as Chief of the Engineer Intelligence Division of the Office of the Chief of Engineers, and his tour of duty with the Photographic and Survey Section of the Joint Intelligence Group of the Joint Staff. The Colonel holds a number of American and foreign decorations.

the New SAF-I-DUO SAFETY GOGGLE



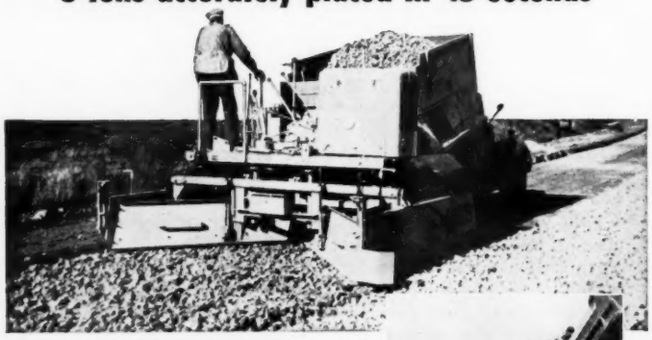
With Replaceable Lens

- Velvety Comfort — VINYL frame fits contour of all faces snugly.
- Lens of Optically Correct OPTILITE
- Maximum protection from Impacts, Chemicals and Dust. (Four types of ventilation.)
- Economical — one-piece replacement lens at low cost. (Lens interchangeable with SAF-I-SPEC.)
- Can be worn over prescription glasses.

Write for literature and prices.

UNITED STATES SAFETY SERVICE CO.
KANSAS CITY 6, MISSOURI BRANCHES IN PRINCIPAL INDUSTRIAL CITIES
In Canada: PARMELEE, LTD. Toronto

Laying highway base without hand labor — 8 tons accurately placed in 45 seconds



JAEGER Paver-Type AGGREGATE SPREADER

costing half the price of bituminous pavers, did all work of placing 12" base of 3½" stone in 8" courses, loose lay. Averaged 45 seconds to unload trucks, spread 11' strip flush to berm, blend joint and strike off. Quickly adjustable for widths to 12½'. Larger size also available for biggest trucks.

Lays all aggregates, free-flowing bituminous mixtures or plant-mixed stabilized soil — highway and airport base, base and top of secondary roads, parking areas, drives.

See your Jaeger distributor or send for Catalog SPS-1

THE JAEGER MACHINE COMPANY 701 Dublin Avenue Columbus 16, Ohio

COMPRESSORS • PUMPS • MIXERS • TRUCK MIXERS • CONCRETE SPREADERS, FINISHERS

Now! MEASURE DISTANCE -AS EASY AS WALKING- with Rolatape

- use on road or cross-country
- simplifies location and maintenance surveys
- invaluable for layout, inventory
- gives quick check on completed work

You will be amazed at how much time ROLATAPE can save you. One superintendent reports, "ROLATAPE saves one man-day *every* day." ROLATAPE is easy to use and is perfectly balanced to maintain a true course.

We will send Model 400 on a *FREE 10 DAY TRIAL!* Try it on your job. You will find this advanced type distance measuring wheel will repay its cost of $54.50 *many times over*. Once you use ROLATAPE you'll never be without it! Write us today. Ask for Model 400.

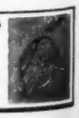
FREE 10-DAY TRIAL!

Rolatape Inc.

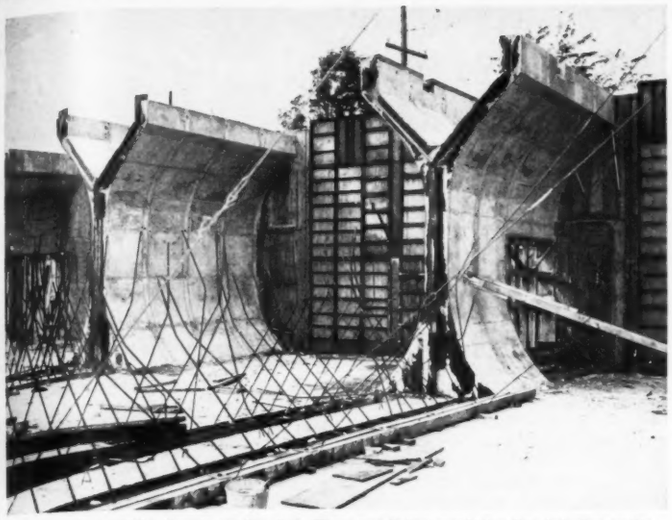
Dept. B, Box 1100, Santa Monica, Calif.

Manufacturers of a complete line of measuring wheels.

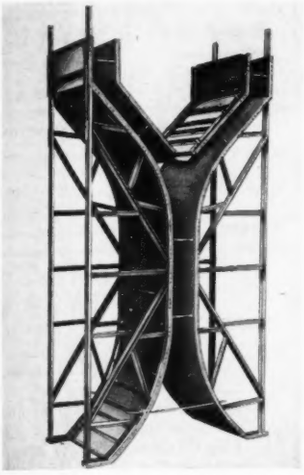
MODEL 400



Records to 100,000 feet, repeats cycle. Weighs 5 lbs. Ruggedly built to give years of hard field service. Smaller and larger models available.



Here are two of the forms on the job. They are being used for the interior walls at the Elmira sewage-treatment plant.



One of the Y-forms Corigliano Bros. used on the Elmira sewage-treatment-plant job. The forms are made of metal pans and trusses.

New Y Wall Forms For Sewage-Plant Job

Special Y wall forms were the main feature of construction work on a sewage-treatment plant in Elmira, N. Y. Corigliano Bros. used the new Universal forms on three interior and two 142-foot side walls.

The forms are made of metal pans and trusses. On the job they were assembled by hand and tied in 14-foot units with 4-inch channels spot-welded to the straight strut of the truss. A crane set the entire unit in place.

The forms were anchored with ¾-inch coil loops spaced about 3½ feet on center. Rods connected to hairpins in the center of the form provided additional anchorage. Ties were ½-inch threaded rods and Spiroloc stud rods for lumber wales. Sixty-five feet of forms were used on the job.

Further information may be secured from Universal Form Clamp Co., 1238 N. Kostner Ave., Chicago 51, Ill. Or use the Request Card at page 16. Circle No. 699.

Phoenix Acquires New Line

Marking its 60th anniversary, Phoenix Products Co., Milwaukee, Wis., manufacturer of Sturdilite floodlamps for heavy-construction machinery, acquired complete ownership of a new welding line, the DryRod electrode oven, formerly sold by Philip Roden Co., of Milwaukee. Phoenix was active in the original design and development of the DryRod oven and the company handled its manufacture for Roden.

Designed to preserve mineral-coated (low-hydrogen type) electrodes from normal shop moisture pickup, the Dry-Rod oven is circular for uniform heat distribution. Recent improvements include a new protective housing for the thermostat control and, where larger-capacity storage is required, a new 900-pound model handling rods up to 24 inches.

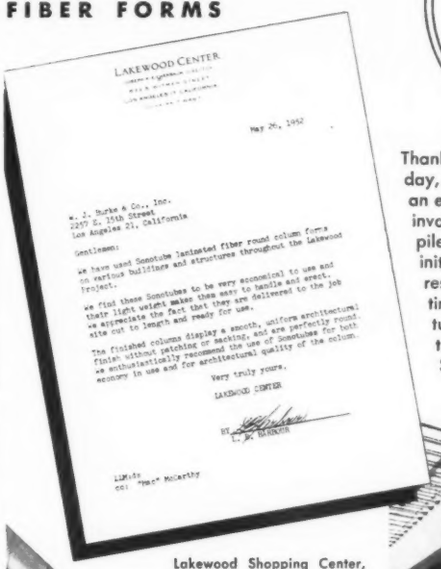
Phoenix also offers a complete metal-contracting service—including metal spinning, welding, fabricating, deep-drawing, forming, polishing, and assembling.

Look What They Said About...

Sonotube® PAT. APP. FOR.

The one-time-use FIBER FORMS

ROUND COLUMNS of CONCRETE



LAKEWOOD CENTER

May 26, 1952

W. J. Burke & Co., Inc.
2209 E. 25th Street
Los Angeles 21, California

Gentlemen:

We have used Sonotube laminated fiber round column forms on various buildings and structures throughout the Lakewood project.

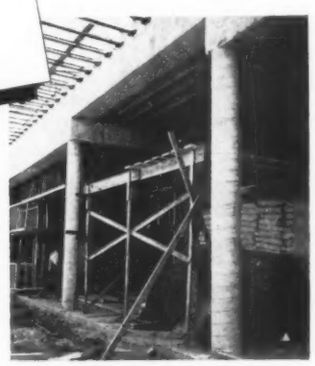
We find these Sonotubes to be very economical to use and their light weight makes them easy to handle and erect. We appreciate the fact that they are delivered to the job site cut to length and ready for use.

The finished columns display a smooth, uniform architectural finish without patching or sacking, and are perfectly round. We enthusiastically recommend the use of Sonotubes for both economy in use and for architectural quality of the column.

Very truly yours,
LAKEWOOD CENTER
By C. W. Hudson

CWHmfs
cc: Mac McCarthy

Thank you, Mr. Harbour! With each day, Sonotubes are being used in an ever widening range of projects involving concrete columns, piers, piles, underpinning, etc. Their low initial cost and ease of handling result in considerable savings in time, labor and money. Sonotubes are available in sizes 3" to 24" I.D., up to 24' long. Saws like wood.



Lakewood Shopping Center, Los Angeles County, Calif., is the nation's largest suburban shopping development. Architects include Armet & Davis; I. Herman Kanner; Albert C. Martin & Associates; of Los Angeles. Lakewood Reservoir, Hedden & Shelley, Engineers, Long Beach.

Write for Complete Information and Prices

SONOCO PRODUCTS COMPANY
Construction Products Division
HARTSVILLE, S. C. MYSTIC, CONN. GARWOOD, N. J. BRANTFORD, ONT.

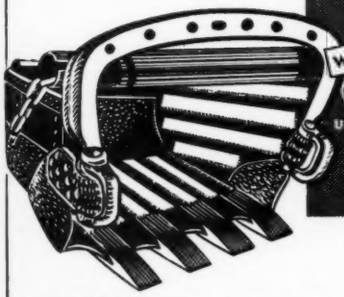
DISTRIBUTORS WANTED—Write for complete details.

MAINTENANCE COSTS GO DOWN...

when you repair DRAGLINE BUCKETS WITH MANGANAL

U.S. Patents 1,876,738-1,947,167-2,021,945

11% -13½% Manganese-Nickel Steel



- MANGANAL is the toughest metal known not harmed by heat.
- Workhardens under impact and abrasion to 550 Brinell.
- Tensile strength to 150,000 p.s.i.
- Dragline buckets repaired with MANGANAL usually outlast new ones.
- For greatest strength attach with MANGANAL Bare or Special Tite-Kote Electrodes.

FREE
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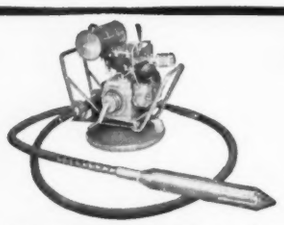

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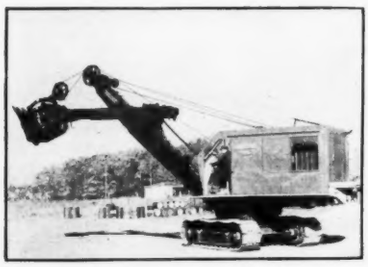

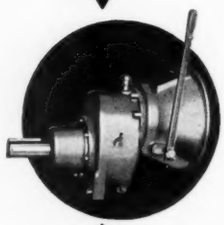

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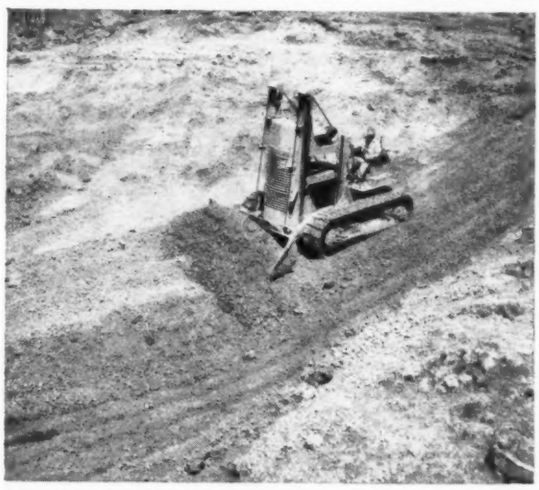

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Scrapers for dirt

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from his 11 Tournapull prime movers

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Here's a typical Halvorson job

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